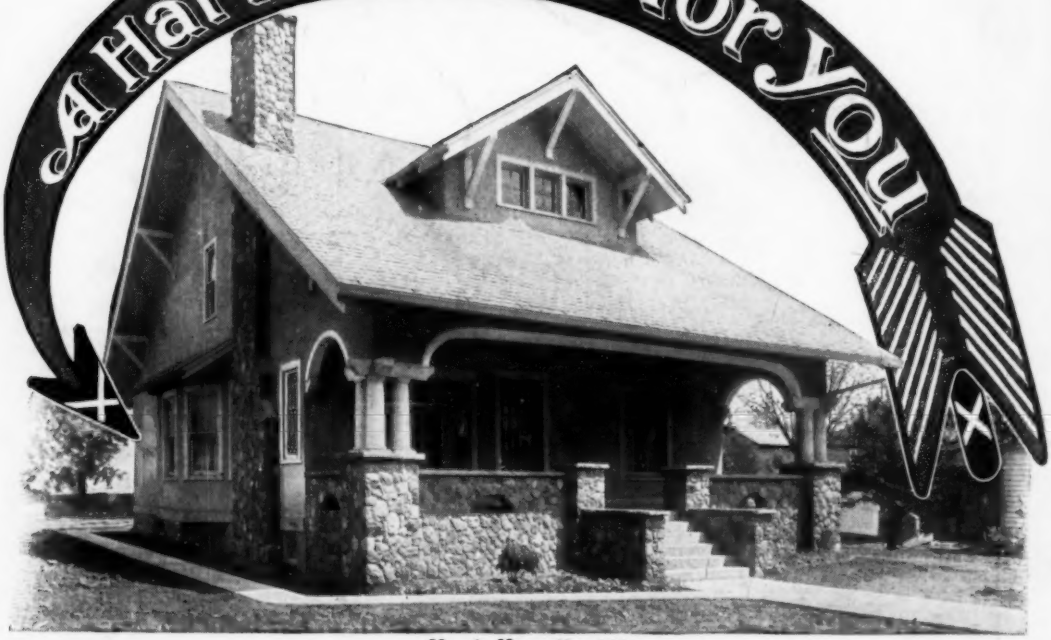
POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

A Harris Home for You



Harris Home No. 161

Now Is the Time to Buy

Material to Build THIS HOME $679

No Money Down—You'll Save From 25 to 50%

Every Harris Home owner has read this message of economy just as you are reading it. Our wonderful offer is not an ordinary home building plan—it's a great deal more than that. The combined result of expert planning, designing and close study of economy in material and construction are embodied. Our *different* methods of purchase, sale and extensive operations makes these low prices possible. In shipping direct to you, we cut out all in-between profits. These are some of the many reasons why you eventually save from 25% to 50%. Buy the material for the beautiful design above, easily built, under our guaranteed *no shortage, no extras system*—not one cent to be paid until the material is received, unloaded, checked and inspected. Direct shipments from Chicago, Washington and Mississippi. Our $10,000 Free Book of Plans shows 100 other modern homes. It's free to home builders for the asking. Mail the coupon below today.

Your Saving For 20 years we have been known for low prices. It's not enough to simply tell you that your saving will be from 25% to 50%—you want to know why. Our different plan of purchase and sale enables us to easily outdistance all competition. Get familiar with our price smashing methods.

Our Proof That's what you want. We can convince you beyond all question of doubt. Thousands of satisfied Harris Home owners have expressed their satisfaction—some of them have purchased as many as 40 Harris Homes. Their testimonials always tell an interesting story of wholesome satisfaction, and dollars saved.

The Design This is our beautiful Harris Home No. 161; bungalow design, built with utmost ease under our guaranteed *no shortage, no extras system* with positive accurate plans. Six rooms, bath, pantry and large closets and modern stairway, leaded casement sash, excellent floor plan, sound construction. The above price includes all first-class lumber, and clear modern Georgia pine interior trim, beautiful 2 panel doors; clear flooring clear cedar shingles. No. 1 dimension lumber. Up-to-date hardware.

Ready-cut doors and window-frames, inside door jambs, outside door and window casings, balance in lengths to work without cutting or waste, wherever possible. All glass in and back puttied.

Plans Free We will send you a complete set of blue print plans, specifications, material list and guaranteed delivered price to your station on receipt of the coupon below and $1.00. If the plans do not suit, return them and 50c will be refunded. The regular price, without coupon is $2.00. You see the object of this offer is not to sell plans, but to save time if plan suits.

Write Today We want you to investigate. It is not necessary to decide on your home with only the design above before you. There are ninety-nine others in our free Plan Book—or we will make plans to your order, after your own ideas. We are here to tell you the truth about what you want to know. Mail the coupon today for your copy of our free Plan Book.

Modern Plumbing and Heating

You can easily install your own Heating Plant with the assistance of our free expert engineering service — in this way you eliminate the biggest expense of installation. Warm air heating plants as low as $67.00, steam heating plants $184.00, and hot water heating plants $154.00. Get our proposition. Let us send you our free Heating Book today.

Our selection of Plumbing material is complete, and sold at the same proportionate low prices. Extra values in high grade brand new "A" quality plumbing material at all times. Enamelled bath tubs as low as $13.00. Complete bath room outfit, bath tub, toilet and wash stand only $37.50.

Send Coupon TODAY!

Dept. DG-7
HARRIS BROS. CO., Chicago

Send me your $10,000 Plan Book FREE
I am also interested in _____

Name _____

Town _____

County _____ State _____

HARRIS BROTHERS CO.

35th and Iron Streets
CHICAGO, ILL.

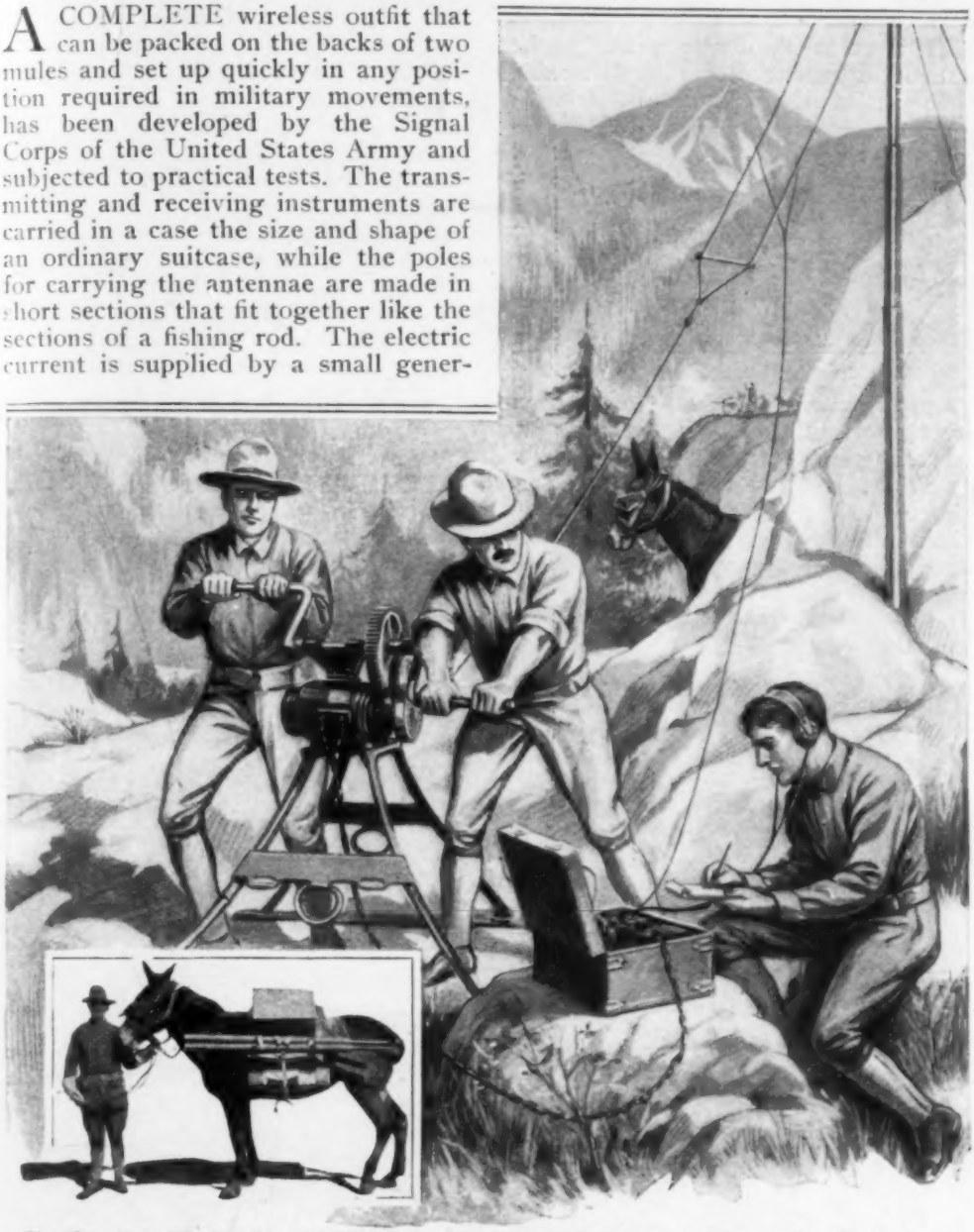
Popular Mechanics Magazine

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 22 AUGUST, 1914 No. 2

Army Wireless Outfit Carried by Mules

A COMPLETE wireless outfit that can be packed on the backs of two mules and set up quickly in any position required in military movements, has been developed by the Signal Corps of the United States Army and subjected to practical tests. The transmitting and receiving instruments are carried in a case the size and shape of an ordinary suitcase, while the poles for carrying the antennae are made in short sections that fit together like the sections of a fishing rod. The electric current is supplied by a small gener-



The New Army Wireless Set with Hand-Driven Generator as It Appears in Service. The Small Picture Shows How It is Transported

ator which is set up in the field and run by hand. With this generator supplying a current of 500 watts, the outfit is capable of transmitting messages in good weather for a distance of about 40 miles, while it can receive messages sent from a much greater distance than this.

HEAVY WIND BLOWS CARS OFF END OF TRESTLE

The velocity of the wind reached during a recent storm in Wisconsin was sufficient to move a string of

Box Car Blown from Trestle by Wind

empty box cars and blow one of them over the end of a trestle. The line of rolling stock was standing on a siding unprotected from the sweep of the wind. After it was once in motion, the momentum increased until the railroad tie spiked across the end of the rails proved inadequate as a safety stop and the leading car plunged headlong into the water.

TANDEM-BIPLANE ENGINES MOUNTED IN BODY

Bearing the general appearance of two biplanes placed end to end, head-on, a tandem air craft, weighing 1,600 lb., has attracted attention because of its unusual construction. The large machine is driven by two 50-hp. motors which are mounted in the body of the car and transmit their energy to the propeller shafts by chain-and-sprocket gearing. The propellers are set one at either end of the body, so that the aft one pushes while the one at the front pulls the machine. The head planes are somewhat smaller than those in the rear, and may be adjusted to different angles during the course of flight. Steering is accomplished by rudders placed at the ends of the wings between the two rear planes, similarly to the Dunne biplane. The car body is incased in aluminum. The length of the machine is 24 ft. 1 in., while the span of the widest plane is 30 ft. 8 in.

BUILDING A BRIDGE OVER THE COLUMBIA RIVER

A curious example of railway-bridge construction is the bridge built across the Columbia River to enable the Oregon Trunk Railway to reach a line running up the Deschutes Cañon. Owing to the turbulent character of this section of the Columbia River considerable difficulty was experienced in finding a suitable site for the bridge, and the best that could be found led directly over the Celilo Falls. At this point the river is 3,500 ft. wide and a bridge having a total length of nearly

Odd Flying Craft with Great Weight

COPYRIGHT, KISER PHOTO CO., COURTESY NORTHERN PACIFIC RAILWAY

Railway Bridge That Passes Directly over the Celilo Falls of the Columbia River: One of the Forks in the Approach Is for the Line to Portland and the Other for the Line to Spokane

1,200 ft. was built. It is a single-track structure built entirely of steel and resting on 29 piers and three abutments, the longest span, that directly over the falls, being 316½ ft. in length. At the north end the bridge forks, the tracks on one branch leading to Portland and the other one to Spokane. The piers rest on solid rock which is entirely exposed during the summer period of low water, while during the remainder of the year the water rushes over the rocks in a furious torrent. For this reason all the work on the piers had to be done during successive summers and entirely suspended during the rainy seasons. As it was impossible to maintain timber falsework for erecting the long span over the falls, this was built out from the piers after the manner of a cantilever.

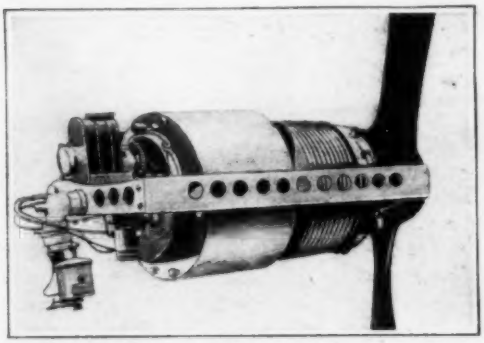
NEW POWER VEHICLE BUILT ON UNIQUE LINES

The latest addition to the family of motor-driven vehicles is the autoped, having the carrying platform below the wheel axles, and designed to be ridden while standing upright on one or both feet, the control being in the steering pillar. The engine, 2½ hp., is built in the front wheel, and the steering pillar is hollow, serving also as the gasoline-supply tank. The working parts are entirely inclosed, making them dust-proof, and there are no pedals or cranks about the machine, which will maintain, so the inventor claims, an average speed of 20 miles per hour over country roads, with a consumption of gasoline of but 1 gal. to the hundred miles.

Pushing the Ground with One Foot will Spin the Motor of This Foot Automobile and Start the Machine

LATEST AERO MOTOR HAS SMALL WIND RESISTANCE

A new aeroplane motor is a cylinder-shaped engine of the revolving



This Odd Motor is Made for Flying Purposes

type. While in many of its principles it is not dissimilar to familiar types of one-valve engines with radial cylinders, it is totally different in general appearance. It carries from 4 to 10 cylinders and is extremely small in diameter, giving less wind resistance, by nearly 80 per cent, than the typical radial motor, and lends itself to the streamline curving of the aeroplane body. The cylinders are inserted at the after end into a barrellike driving-gear chamber. The power developed upon the pistons is transformed into a revolving motion for the whole motor.

BIG ROLLER MILL TOPPLES INTO RIVER

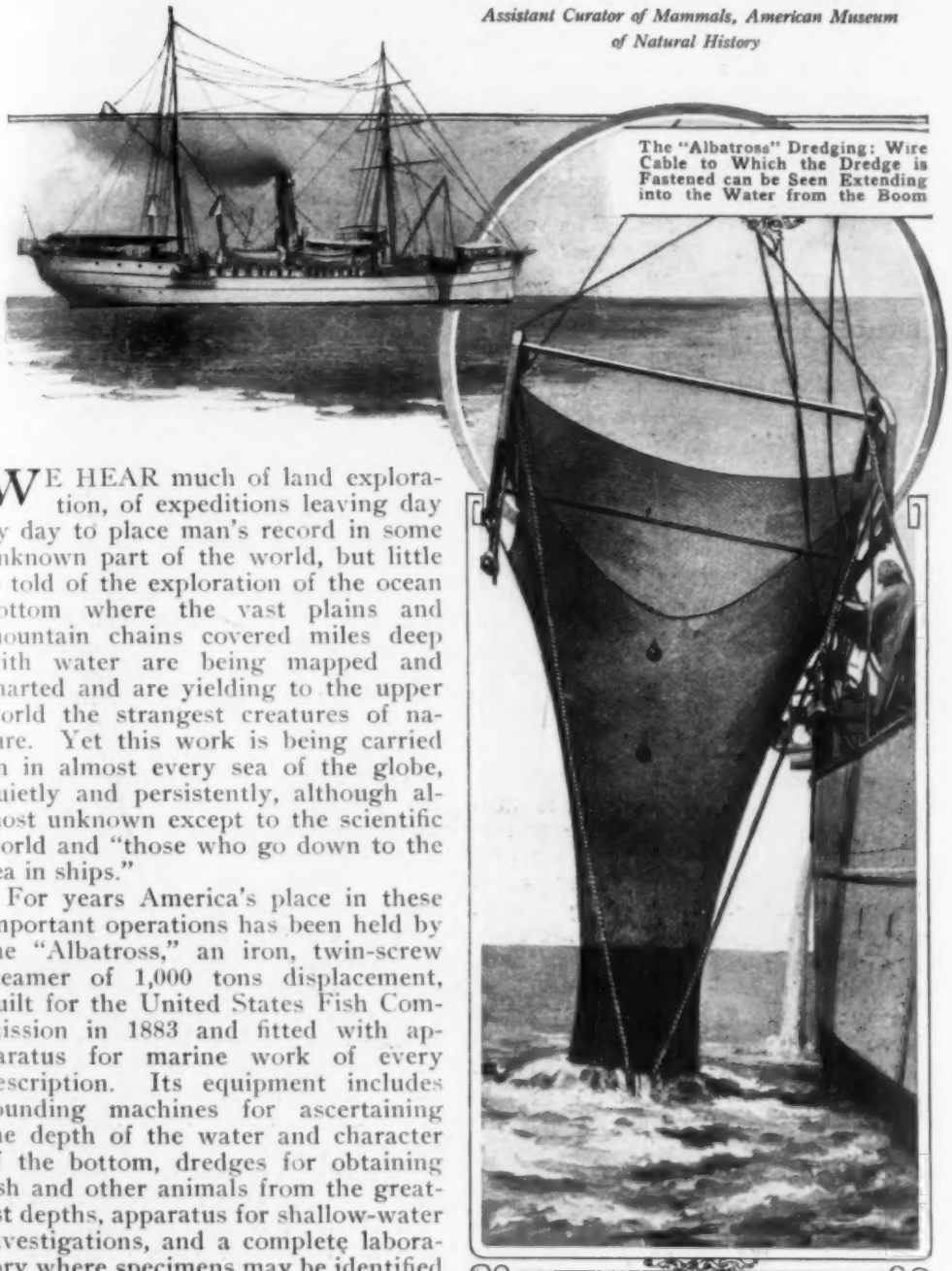
One of the largest roller mills in Minnesota was reduced to a tangle of machinery and timber recently when its foundations were washed out by the rush of water following the breaking of the dam that impounded the water for supplying the mill with power. The mill was situated at the top of the steep bank of the river just below the dam. As the result of a period of high water the dam gave way and the rush of water swept the narrow channel below, undermining the mill and toppling the structure into the bed of the stream. The building and machinery are practically a total loss. Continuing down the stream the rush of water did additional damage amounting to about $50,000, flooding hundreds of acres of land and tearing out four bridges, one of which was of concrete construction.

Big Minnesota Roller Mill That Toppled into River When Foundations were Undermined by Rush of Water from Breaking Dam

SEEKING THE SECRETS OF THE SEA

By ROY CHAPMAN ANDREWS

Assistant Curator of Mammals, American Museum of Natural History



The "Albatross" Dredging: Wire Cable to Which the Dredge is Fastened can be Seen Extending into the Water from the Boom

Hauling in the Huge Net with Trophies Drawn from a Depth of Five Miles

WE HEAR much of land exploration, of expeditions leaving day by day to place man's record in some unknown part of the world, but little is told of the exploration of the ocean bottom where the vast plains and mountain chains covered miles deep with water are being mapped and charted and are yielding to the upper world the strangest creatures of nature. Yet this work is being carried on in almost every sea of the globe, quietly and persistently, although almost unknown except to the scientific world and "those who go down to the sea in ships."

For years America's place in these important operations has been held by the "Albatross," an iron, twin-screw steamer of 1,000 tons displacement, built for the United States Fish Commission in 1883 and fitted with apparatus for marine work of every description. Its equipment includes sounding machines for ascertaining the depth of the water and character of the bottom, dredges for obtaining fish and other animals from the greatest depths, apparatus for shallow-water investigations, and a complete laboratory where specimens may be identified and packed, and scientific studies carried on.

The most important work which the "Albatross" has done, and that for

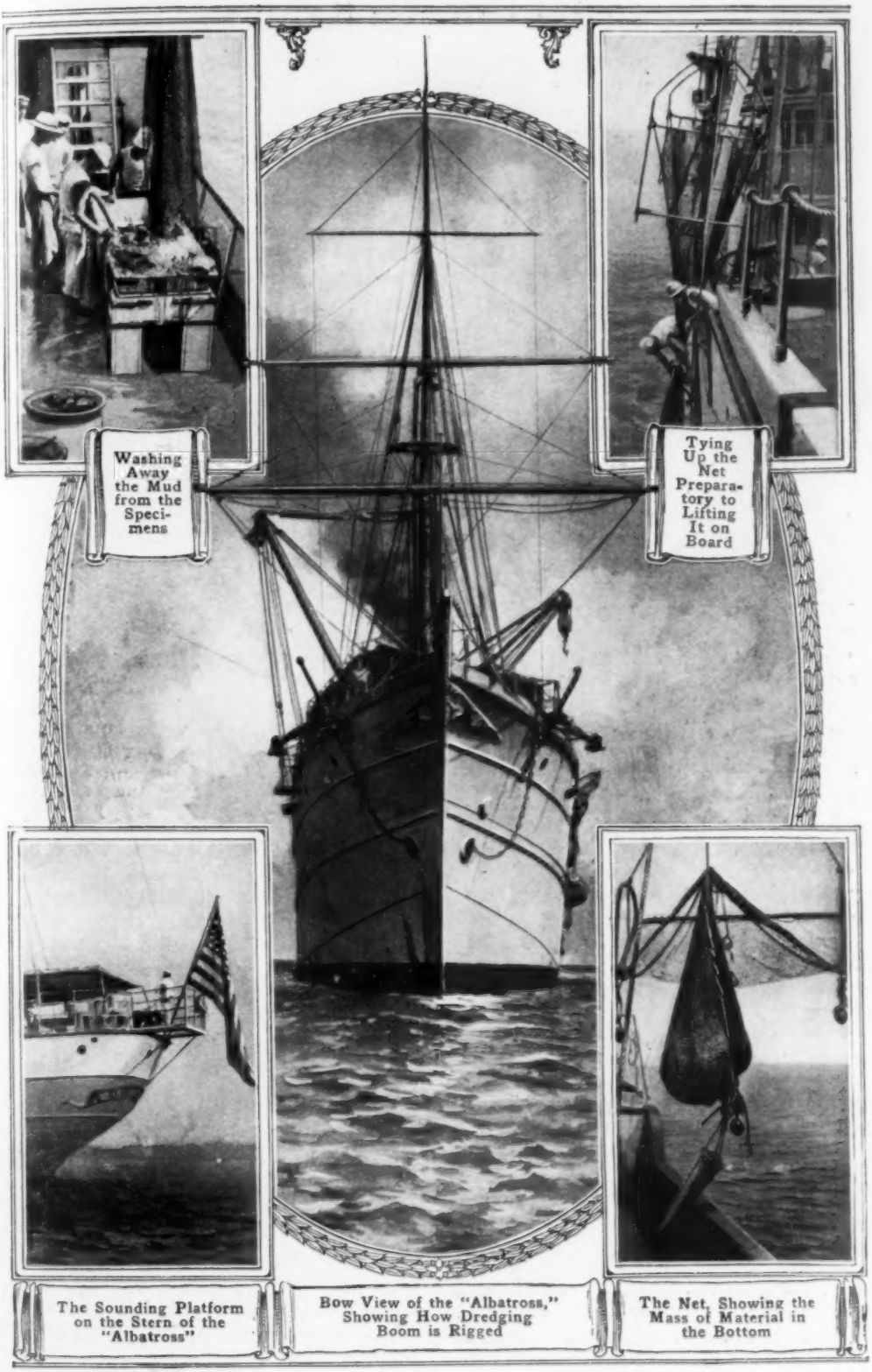
which it is best equipped, is deep-sea sounding and dredging. It is by means of soundings patiently taken one by one that almost every important submerged mountain chain and peak has been plotted and that we know the materials which cover the ocean floor.

Over the stern of the "Albatross" hangs a narrow railed platform with an open bottom, and it is through this that soundings are taken. The sounding machine consists of a triple-cylinder, compensating steam engine which turns a reel on which some 35,000 ft. of steel wire are wound. For depths of a mile or less, a 35-lb. shot is used to carry the wire down, and for greater depths a weight of 60 lb. Each shot is perforated with a 2-in. hole so that it may be slipped over the cylindrical brass sounding cup, which trips automatically on striking the bottom and drops the shot, while the sounding cup itself sinks into the mud and brings up a small portion as a sample. A water bottle is also fastened to the wire and is sent down with its valves open. On being hauled up, the reverse motion closes the valves at once and thus water from the very bottom of the ocean is brought to the surface to be tested for its specific gravity. A thermometer in a brass case is also clamped to the sounding line and is lowered right side up. On starting back to the surface the water wheel upsets the thermometer, which is brought to the surface with the mercury in the same position as when it left the bottom.

In the great depths the water is just above the freezing point, no matter what its temperature at the surface. When the "Albatross" was in the Dutch East Indies and we were working in a temperature of 110° F. the men who sorted out the specimens in the bottom of the dredge net were dressed in the thinnest of gauze undershirts but wore long mittens to protect their hands and arms from the ice-cold mud. This was a great comfort, too, in that blistering heat, for a cool drink could be obtained in a very few minutes by burying a bottle in the mud, no matter how hot the sun which was blazing down upon us.

By means of a register the number of feet of wire which has run out before bottom is found is indicated, and this is reported to the officer in charge. Thus at every sounding the depth of the water, its temperature and specific gravity at the bottom as compared with that at the surface, and the character of the ocean floor are learned, and the chart prepared accordingly. The deepest sounding which has yet been made by any ship was in the Pacific Ocean between the Hawaiian Islands and Japan and showed a depth of 6½ miles. During the past 27 years the "Albatross" has made some 5,000 separate soundings in the Pacific and Atlantic oceans.

There are two styles of dredges by means of which the animals and fish of the great depths are captured—the nets which are dragged over the bottom and those trawled just below the surface. The bottom dredge consists of a pair of heavy iron running frames connected by one or two crossbars, 12 ft. in length. Fastened to this frame is a cone-shaped bag 30 ft. long, made of heavy web, the end of which is closed by a lashing. The dredge is hung over the starboard side of the ship on a long boom and by means of a steel cable is slowly lowered to the ocean bottom. A dial indicates the number of feet of wire out, and a pointer on a scale shows the strain, which often amounts to five or six tons, upon the cable. When the dredge has reached the bottom the ship steams ahead at about two-thirds of a mile an hour, dragging the net over the ocean floor. It remains down for an hour or so, and is then slowly lifted to the surface. The deepest haul which the "Albatross" has ever made was 5½ miles, and it was 17 hours from the time the dredge was first lowered until it again appeared. The net is towed beside the ship for a few minutes, then it is swung on board, the lashings at the bottom unfastened and the contents dropped upon a table. The ice-cold mud is carefully washed away



Washing Away the Mud from the Specimens

Tying Up the Net Preparatory to Lifting It on Board

The Sounding Platform on the Stern of the "Albatross"

Bow View of the "Albatross," Showing How Dredging Boom is Rigged

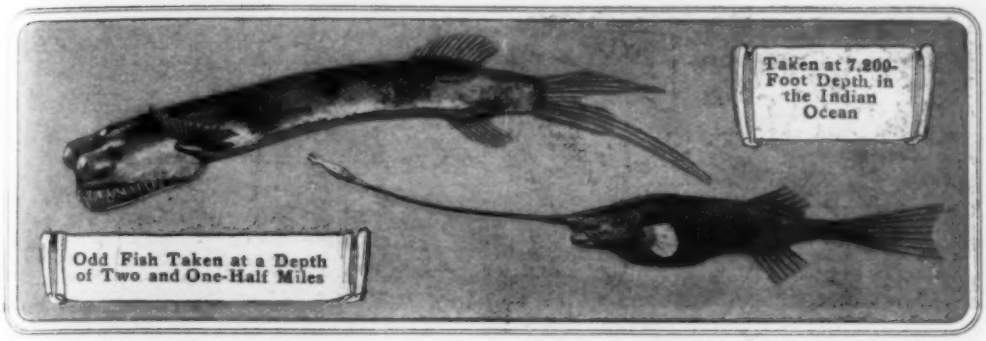
The Net, Showing the Mass of Material in the Bottom

Fish with Eyes at Ends of Stalks Taken in Indian Ocean at a Depth of 6,000 Feet
This Peculiar Deep-Sea Fish Has Enormous Eyes Which Occupy Upper Part of Head
Venus'-Flower-Basket Sponge, Found at Great Depths
Taken at Two and One-Half Miles Depth: This Fish Has an Enormous Mouth and Stomach. It is Able to Swallow Food Much Larger Than Itself

candescent lamps far in front of them to light their way in the inky blackness miles below the surface; others with phosphorescent spots along their sides which must glow like the portholes of a steamer at night; still others with their eyes upon long stalks or with no eyes at all. And, poor things, when released from the terrible pressure to which they have become accustomed, their eyes often pop from their heads and their stomachs turn inside out. Most of the deep-sea fish are small and many are slate-colored; a few partake of reddish brown and some are inky black. Perhaps the dredge has been drawn through a bed of sponges, and numbers of the beautiful Venus'-

and the specimens carried to the laboratory.

It is like opening a Christmas package for a naturalist to watch the dredge come to the surface bringing unknown treasures from the hidden depths. Strange fish are found which carry in-



flower-baskets may be entangled in its meshes.

Usually, at depths of several miles, the marine life is disappointing and not of great variety. On our Dutch East Indies cruise we found that below a mile fish were scarce, but that the net always contained great quantities of huge, purplish sea urchins and other specimens of that family.

But the work of the naturalists on the "Albatross" does not consist entirely in studying deep-sea life and the ocean bottoms. The shallow-water forms are just as important, and to catch these a heavily weighted 10-ft. ring, to which is lashed a net of fine mesh, is towed along halfway between the surface and the bottom. Sometimes at night this net is fastened just under the water and an electric light hung from the boom above it to attract the surface-living fish.

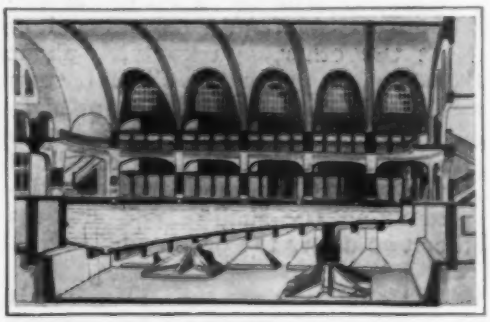
The "Albatross" has done much collecting along beaches and in rivers with seines drawn by a crew of six or eight men. But most interesting of all methods of shore collecting is dynamiting the fish which congregate in great numbers upon the coral reefs of the tropics.

Peering through a glass-bottomed box, one looks down upon a marvelous garden filled with coral flowers of the most exquisite colors where fish of brilliant hues dart in and out. A shot of dynamite exploded by electricity in this most wonderful of nature's gardens leaves it shattered and torn, but brings to the surface many varieties of fish which otherwise could never be secured.

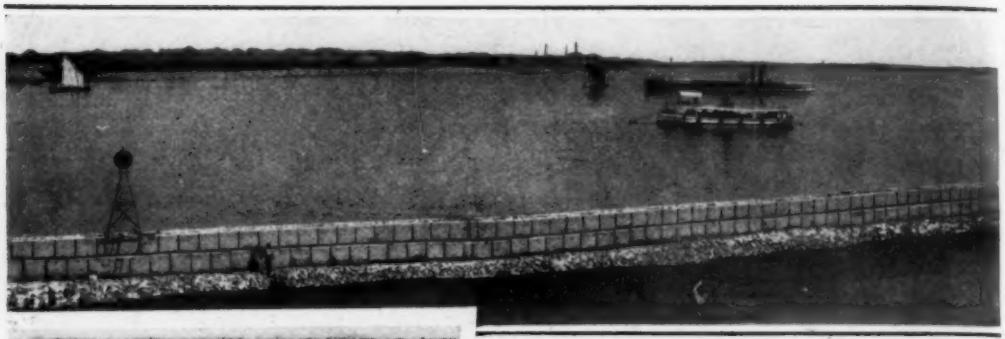
The "Albatross" and sister ships of many nations are carrying on other important studies of the deep sea which can be only mentioned here. The distance to which light penetrates below the surface has been determined by exposing photographic plates on electric wires at different depths; currents are being followed and mapped, and tidal observations taken. All these investigations may seem very far removed from the practical life of today, but it is only through such work that the thoroughfares of the sea have been made almost as safe as are those on land, and that the mysteries of the ocean are being written for all to read.

A SWIMMING TANK WITH THREE-POINT SUPPORT

An unusual form of foundation for a concrete swimming tank has been installed in Germany in a coal-mining district where the ground is badly undermined by galleries and the footing therefore insecure. In order to make



Swimming Tank Has Three Points of Support, and may be Leveled Readily in Case of Settlement



COURTESY ENGINEERING NEWS

River-Training Wall at Rangoon, on Brushwood

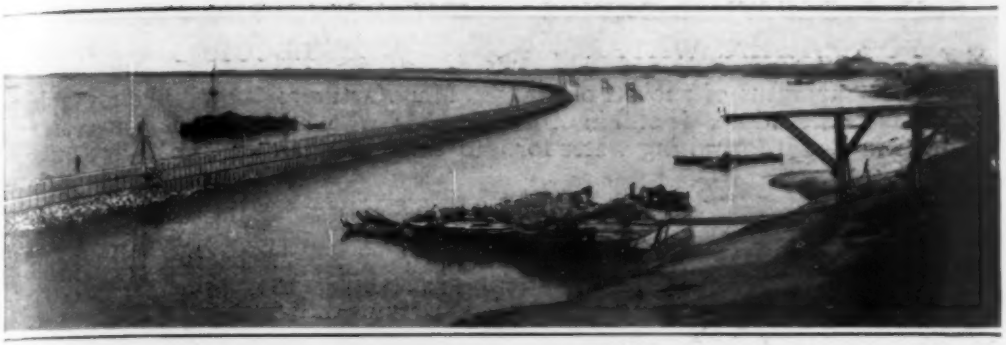
Pipe Line Used with the Hydraulic Dredge in Restoring the Old Channel

it possible to bring the tank back to a level position readily in case it settles, it is supported at three points and the construction at these points is such that the tank can be raised by hydraulic jacks at any of these supports, and wedges inserted between the foundation and the bottom of the tank in case of necessity. The tank and its foundations are entirely independent of the building. The tank itself is built of reinforced concrete, is 82 ft. long and 40 ft. wide, and weighs about 1,000 tons when filled. It has a depth of 2⅔ ft. at one end and 10 ft. at the other, and contains about 18,000 cu. ft. of water. The bottom has a series of transverse ribs for making it rigid, and the supports are so placed that each takes about one-third of the weight, one support being located under the shallow end and the other two under the deep end.

¶A tunnel under the Danube is planned by Roumania to connect the territory acquired by the Balkan War.

CONTROLLING THE RANGOON RIVER IN BURMA

To prevent the river at Rangoon, Burma, from shifting its channel, with the resulting formation of sand bars at some points and the creation of dangerous tidal currents at other points along the water frontage of that city, one of the biggest river-control systems ever built has just been completed. This work consists principally of a river-training wall about two miles long, much of which is built in water having a depth of over 58 ft. at high tide. The wall is composed of rubble stone, has a bottom width of 225 ft. and rests on a series of brushwood mattresses, 3 ft. thick. In the construction of the wall 6,000,000 bundles of brushwood and 1,500,000 tons of granite were used, and the total cost of the wall was about $5,000,000. At the top the wall is built well above high-tide level by means of concrete slabs. While the construction of the wall itself consisted of little more than the dumping of stone from barges at the required points, the making and placing of the mattress foundations was a difficult and somewhat risky undertaking. These were woven on slipways that were clear of water at low tide but submerged at high tide, and it was necessary to complete each 80 by 120-ft. section in the time between two successive high tides. Each section was then towed out at high tide by tugs, weighted with stone and sunk in position. In this work the greatest care



Burma: This Wall, Which Cost About $5,000,000, is About Two Miles Long and Rests Mattresses, Much of It being Built in Water Over 58 Feet Deep

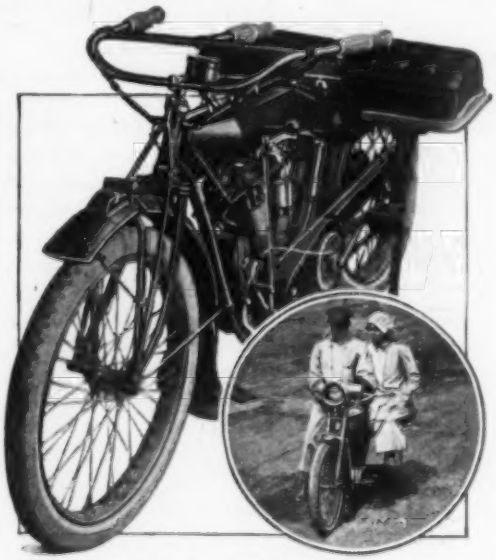
and skill were required, as there was always danger that the mattress might be torn loose from the tugs or upset by the strong river and tidal currents.

ROAD-BUILDING METHODS TO BE STANDARDIZED

With a view to discovering the points of excellence and the defects in existing local methods of building and maintaining roads and to establish uniform and better methods, the U. S. Department of Agriculture is soon to begin an exhaustive study in coöperation with the road authorities of the different states. Each state will be asked to designate counties that present typical or exceptional features as to topography, character of road materials, methods of construction, etc., and from these lists 100 counties will be selected for intensive study by the Division of Road Economics. Methods of financing local road improvements vary from the practice of calling on farmers for a certain period of work each year, in place of a road tax, to the issuing of road bonds, and there is an equally wide variation in organization and methods of construction. As a result of this exhaustive study of the subject it is expected that the department will be able to say what system or combination of systems works best under actual conditions. One important feature of the investigation will be the study of the use of convict labor in road construction.

NOVEL MOTORCYCLE SEATS SIDE BY SIDE

In order that two persons may ride upon a motorcycle, both facing the same direction and side by side upon the frame, a novel contrivance has been manufactured by a New York concern, in which a seat is built arch-shape, with spring cushions about 5 in. thick. The seat has three points of support on the frame of the motorcycle, one at the seat post and two opposite rear-

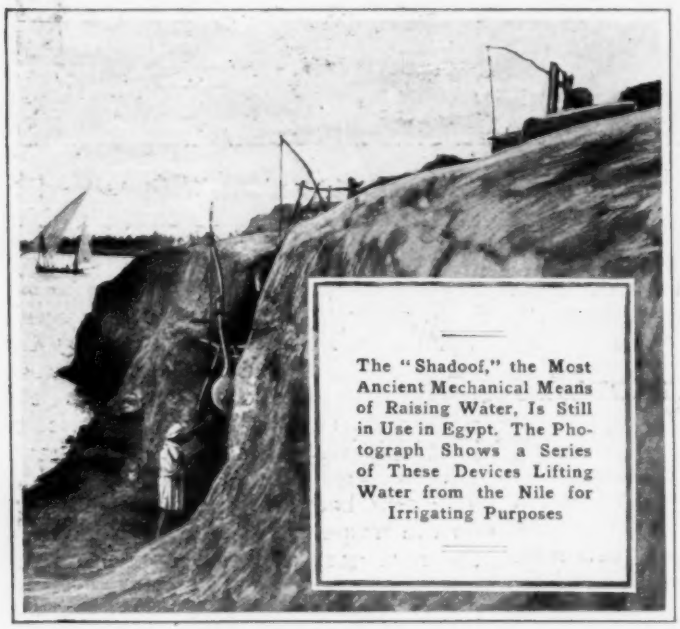


A Late Type of Motorcycle Seat for Two Persons

ward bearings, one on either side of the frame. The cushions do not project above the plane of the seat-post fastening.

CRUDE EGYPTIAN DEVICE FOR RAISING WATER

A crude apparatus of ancient origin, known as the "shadoof," is still in common use in Egypt for raising water for irrigation purposes. The shadoof can be traced back 5,400 years, or to about 3500 B. C., and the indications are that it was considered an ancient device even at that remote time. It is much like the old-fashioned well sweep, consisting of a pivoted pole, supported on two uprights, at one end of which is suspended a rope or pole with a bucket at the lower end. In using, the bucket is simply dipped into the water and is then raised by pulling down on the opposite end of the pivoted pole. When the bucket is raised to the proper height the water is emptied into a channel that leads to the field or to a point within reach of a second shadoof, as the case may be. The weight of the filled bucket is counterbalanced by a mass of sunburned clay fixed to the opposite end of the pivoted pole. In some cases as many as five shadoofs are used for raising the water to the required height.



The "Shadoof," the Most Ancient Mechanical Means of Raising Water, Is Still in Use in Egypt. The Photograph Shows a Series of These Devices Lifting Water from the Nile for Irrigating Purposes

ENLARGING PHONOGRAPHIC RECORDS

Manufacturers of phonographic records who have found it necessary to enlarge or reduce the cylinders or the disks upon which the vibrations are recorded, have used a mechanism based upon the principle of the pantagraph, but objection was found in that both the needle and the arm carrying it in the reproducing instrument added their distinct vibrations to those already engraved upon the roll. A German scientist has recently invented a method which obviates this difficulty. A copper shell of the original wax record is first obtained by electroplating, and upon this a second mold is made, of very concentrated gelatin in water. This when set may be shrunk by soaking it in a bath of formaldehyde, or enlarged by a water bath. From either of these processes a second copper shell is made, and the process repeated until the desired enlargement or reduction is obtained.

HIDDEN ORCHESTRA FEATURE OF MODERN THEATERS

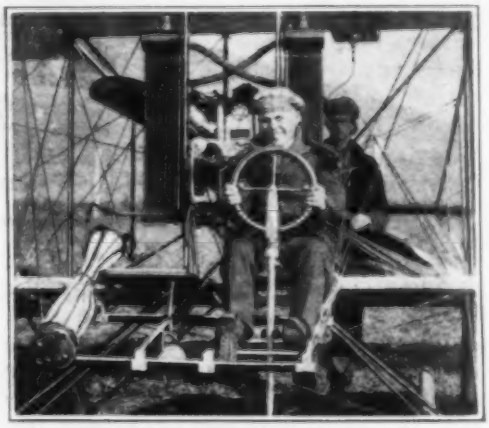
One of the most important of modern developments in theater construction is the hidden orchestra, which, with the other desirable features made possible by it, has already come into extensive use in Europe. The arrangement consists simply in providing an orchestra pit that is open at the top and is depressed below the floor of the theater so that the orchestra is hidden from the view of the audience. The original idea was to remove the distraction caused by an orchestra work-

The Newest Idea in Theater Construction is the Concealed Orchestra, Hidden in a Pit between the Stage and the Auditorium. The New Festival Playhouse at Baireuth is So Equipped

ing in full view of the audience, but it has since been found that the plan possesses other advantages of as great importance as this. One of these is that, in this position, the orchestra does not dominate a concert or operatic performance, as is often the case with the old arrangement of theaters, but that the orchestral music takes its place as an adjunct to the stage singing and blends properly with it. The sunken orchestra pit also simplifies the arrangement of the stage, which, instead of being placed 5 ft. or more above the floor of the theater, need be only about 1 ft. above floor level when built in connection with a sunken orchestra pit.

GOLFER USES BIPLANE IN TRIP TO GOLF LINKS

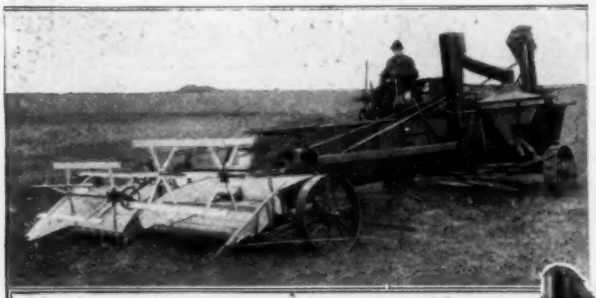
The use of the aeroplane for purposes other than spectacular amusement has become frequent. To employ a machine, however, as a means of transportation to and from a golf course is the unusual purpose to which a New York airman puts his craft. Besides being a flier he is a golf enthusiast and recently flew from Bath, N. Y., to a country club at Elmira with his clubs strapped to the passenger seat of his biplane. The trip of 38 miles was accomplished in about an hour.



Golfer-Airman Starting to Links

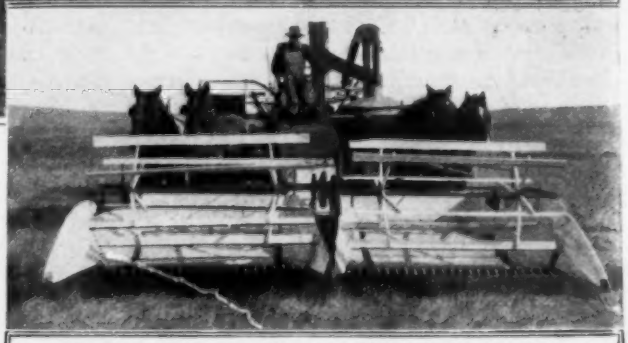
HARVESTER CUTS, THRESHES AND SACKS GRAIN AT ONCE

In the application of modern machinery to the agricultural industry, the work of the farm has been revolutionized completely in comparison with what it was only a few years ago. A new harvester cuts, threshes and sacks grain in a single operation. Loading wagons follow it, picking up the sacks of grain ready for shipment. The machine is drawn by two spans of horses hitched at its sides back of the cutting bars. A 40-hp. gasoline engine furnishes energy for threshing and sacking. After the grain is cut it is thrown back upon tables whence it is forced into the thresher mechanically. The grain is then carried to the sacking device, where the sacks are filled, sewed and dropped.



Side View of Machine Which Performs Every Operation Attending the Harvesting of Grain

At the Rear of the Harvester is the Sacking Device Which Automatically Drops Its Load



In Operation the Machine is Pulled by Four Horses Hitched at the Sides

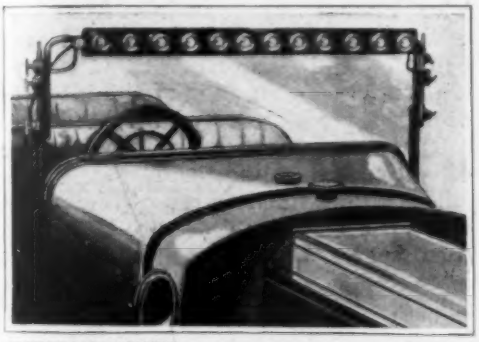
NO GOVERNMENT GUARANTEE ON FOODS OR DRUGS

Owing to the fact that the serial number and the legend "guaranteed under the food and drugs act," used on the labels of proprietary articles, has been interpreted by the public as a guarantee by the government, the Secretaries of the Treasury, Agriculture, and Commerce have issued a joint notice abolishing the use of such serial numbers and legends after May 1, 1915. The practice which this notice abolishes was instituted in 1906 at the request of manufacturers to enable them to file blanket guarantees with the government by which they relieved the dealers to whom they sold of all legal responsibility for the purity of the goods, but the system was never intended as a guarantee to the public or

as indicating in any way that the goods had been inspected and approved by the government. In connection with this blanket guarantee a serial number was issued which manufacturers were allowed to place on their labels. The only guarantee approved under the new regulation is an individual guarantee covering the goods in a specific invoice or bill of sale.

USE NOVEL MOTOR LIGHT ON CITY STREETS

One of the novel ideas for automobile headlights, which will give an adequate but not blinding glare for street use in cities, has been introduced in France. An adjustable bar, carrying 12 electric lights supported in reflectors, is attached at the hinging point of the windshield. Because this is pivotally attached to brackets, it is possible to reflect the light in almost any direction. In case of engine trouble, it is a simple matter to throw the light under the hood when it is raised. The bar also may be turned backward, lighting the car itself.



COURTESY L' ILLUSTRATION
French Auto Lights Embodying New Idea

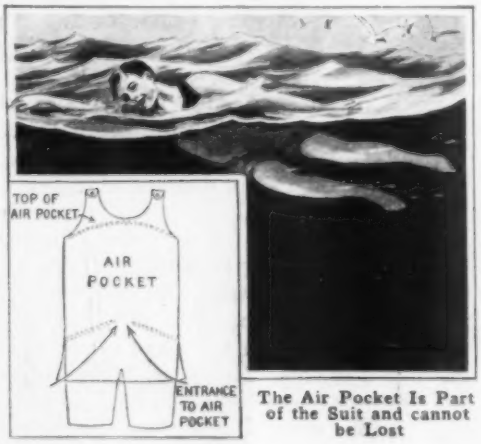
COLORED GLASSES RIVETED TO BALL PLAYER'S CAP

Sun shields, riveted to the beak of a cap and so hinged that they are instantaneously adjustable, is the latest device designed to protect the eyes of the ball player from the blinding rays of the sun. When a ball is batted for a long drive, the fielder touches his cap and the glasses fall into position before his eyes, allowing him to see the rapidly approaching ball while looking directly at the sun. When not in actual use the arrangement may be folded up out of the line of vision.

These Glasses Allow a Ball Player to Work Against the Sun's Rays

WATERPROOF BATHING SUIT MADE WITH AIR POCKET

Made of chemically treated nonabsorbent material which does not cling to the body when damp, a bathing suit, fitted with an air pocket capable of sustaining the weight of the swimmer, has received a patent. Because the gar-



The Air Pocket Is Part of the Suit and cannot be Lost

ment turns the water instead of being soaked by it, protection also is given against chill winds while on the beach. The upper half of the front part is made double, with an opening left at the bottom below the waistline. If this pocket is held open as the bather enters the water, it is filled with air and automatically sealed. This prevents sinking, provides a means of rest for long-distance swimmers and gives confidence to beginners.

A CALIFORNIA CONCRETE-BUNGALOW COURT

By ALBERT MARPLE

One of the latest home-building features in southern California is the bungalow court, which consists of from six to ten or more small homes grouped on a single lot. Until recently the buildings of this class have consisted mainly of small frame or plaster cottages, costing from $600 to $800 and renting at from $12 to $15 a month. Now the concrete-bungalow court, the latest solution of the housing problem, has come in. The principal features of a residence group of this kind, that has just been completed in Hollywood, Cal., are shown in the accompanying illustrations.

This court consists of ten small reinforced-concrete houses, all built from the same set of plans and each containing living room, dining room, bedroom, sleeping porch, bathroom and kitchenette. In addition to these there is a concrete cellar, 8 by 8 ft., in which the instantaneous gas heater is kept, and which is provided with shelves for canned fruit, etc. The lot is 66 by 200 ft., each house taking up a space of 20 by 30 ft., and costing $1,500.

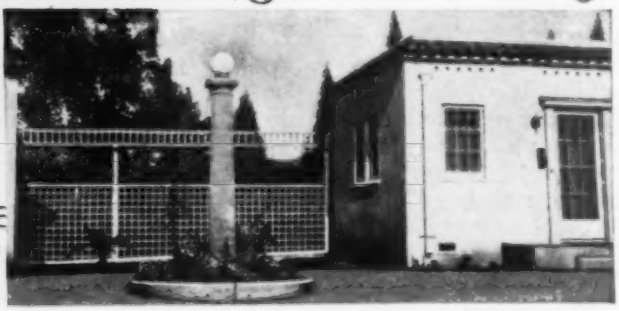
Each of these homes is a model of completeness. The living room is 12 by 14 ft., and has mantel, fireplace, hardwood floor, papered walls and tinted ceiling, and is provided with indirect lighting. Next to the living room is the dining room, 10 by 12 ft., with leaded-casement windows, buffet, drawers for linen, and closets for dishes. This room also has hardwood floors and indirect lighting. The living and dining rooms are separated by buttresses that extend 1 ft. from the wall and are 3 ft. high, and the spaces between these are converted into fancy china closets on the dining-room side. The bedroom is 8 by 10 ft., has leaded-glass windows, and is provided with a sliding bed which runs between this room and the sleeping porch, permitting either indoor or outdoor sleeping. The kitchenette branches from the dining room, is 6 by 9 ft., and is a compact and complete "commissary" department. The door of the kitchenette is the rear door of the house.

The visible portions of the roof are of red cement tiling, lending a "Spanish" feature. All parts of the court not in cement are set to lawn and shrubbery. The entrance to the court is at the center of the short side of the lot which faces on the street, and at each side of this entrance is a concrete post bearing a 10-in. frosted-glass globe, which is electrically lighted. From the entrance, cement sidewalks extend down the middle of the court with branches to the individual houses. At the rear is a cement yard and garden place for the exclusive use of the residents, and in the center of this space is a concrete post bearing a light identical with those at the entrance. An artistic lattice fence that runs completely around the property adds to the exclusiveness of the little "community" that lives in these houses.

¶With a 21-per-cent increase in population in the United States between 1900 and 1910 there was an increase of 61 per cent in the number of bakeries and of 127 per cent in the value of bakery products.

Rear Entrance to One of the Bungalows

Ornamental Lighting Standard at Center of Garden Place

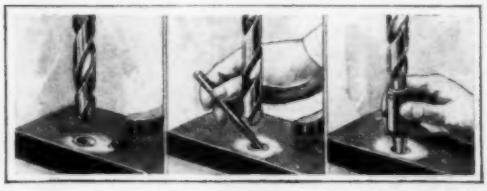


Garden Place Used in Common by Court "Community"

Main Entrance to Concrete-Bungalow Court

TOOL FOR DRAWING DRILL IN METAL DRILLING

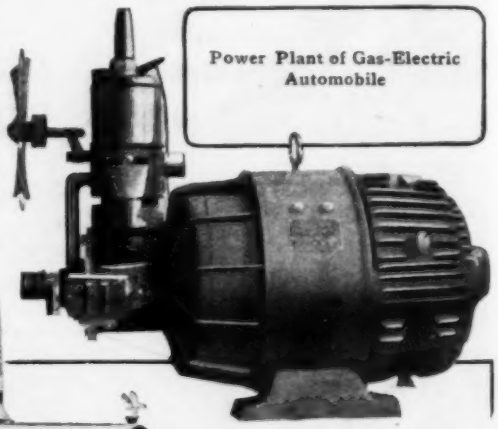
In drilling metal work it is a common thing for the drill to run slightly off the correct position at the first impression, or countersink. Where great accuracy is required it is then necessary to draw the drill back to the correct position, and this is usually done by chiseling one or more notches in the side of the countersink. A tool which accomplishes the same result by drilling a $\frac{3}{16}$-in. pilot hole slightly off the center of the countersink and in the direction desired has recently made its appearance on the market. This tool is simply fitted into the countersink with the flat side of the casing placed in the direction of the draw and the drill is let down upon it and started. The drill engages a groove in the upper shaft, which is central with the drill, and the rotary motion thus given to this shaft is transmitted to the offset pilot drill at the bottom of the centering tool. The casing does not revolve, so that the tool is held in position by hand without difficulty.



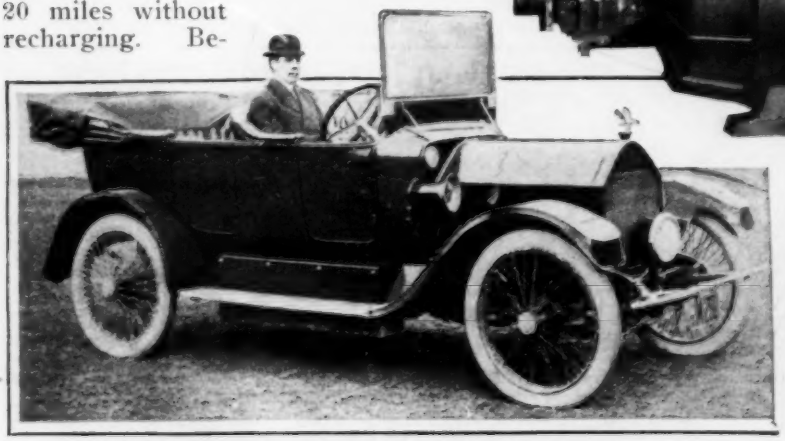
New Tool for Drilling Pilot Hole and How It is Applied

NEW AUTO USES GASOLINE AND ELECTRICITY

Bearing the external appearance of an ordinary gasoline car, a gas-electric automobile, which is driven by electricity generated by its own power plant, has lately been patented. The current is developed with a 10-hp. engine and a 5-kw. dynamo which propel the motor. When the machine is not running at its maximum speed, which averages between 25 and 30 miles an hour, the surplus power is diverted to the storage batteries, which will drive the car 20 miles without recharging. Between 20 and 30 miles can be covered on one gallon of gasoline. In general principle it is in many respects like an electric machine, excepting that, instead of depending upon batteries, it has a constant source of en-



Power Plant of Gas-Electric Automobile



Electric Automobile with Outward Appearance of Gasoline Car

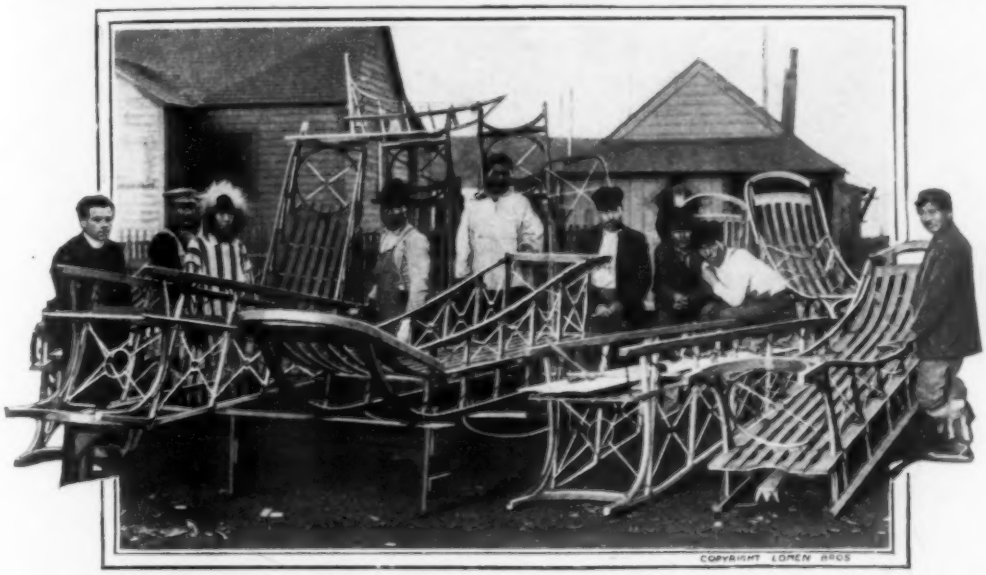
ergy. Because of the slight loss of efficiency in electrical transmission, and also on account of the constant direct pull of the motor, it is possible for this car to perform its function on much less horsepower than is required by the usual type of gasoline automobile.

MINE SURVEYING AIDED BY USE OF BALLOON

Use of a small balloon with a light stadia rod attached at its lower end has been tried experimentally with some success in making interior surveys of iron mines. The gas bag is controlled by the employment of a fish-line and reel. Graduations on the stadia rod are illuminated by two small electric lights, made necessary because of the high explosive qualities of hydrogen and oxygen in mixture. The balloon used in the test leaked too greatly to make the trial wholly a success. What was accomplished, however, tended to show that under favorable circumstances the method might be of real advantage. The gas bag used was 6 ft. high and 5 ft. in diameter, giving a lifting force of approximately two pounds.

ESKIMOS BUILT SLEDS FOR STEFANSSON PARTY

When Vilhjalmur Stefansson started on his arctic expedition which was brought to an abrupt end Jan. 16, 1913, by the sinking of his ship "Karluk" in the ice floes, he carried dog sleds made by Eskimos at Nome, Alaska. The plans were furnished by the explorer, but the work was left entirely to the natives under the guidance of a mission priest. Strength and lightness were the two essential features in the construction work. A minimum amount of lumber was used, but every joint was braced and reinforced. Eight of the snow vehicles were made, and when completed they were strong enough to carry all that could be loaded into them. These were among the things saved by the explorers when the ill-fated ship went to the bottom, and with which they made a perilous trip across the ice to Wrangell Island, where they are supposed to be awaiting a rescue ship.

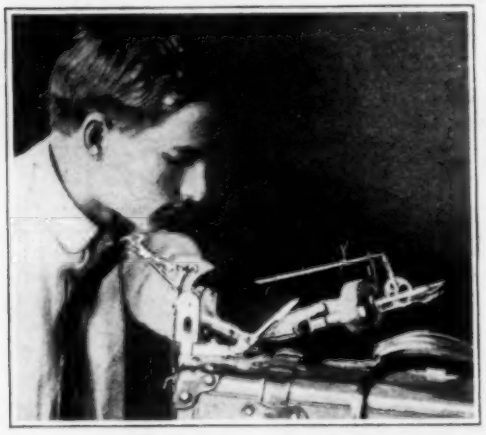


Sleds Used by Stefansson on Arctic Expedition, Made by Eskimos at Nome, Alaska

¶The fuzz on yarn used in knitting stockings is removed by passing the yarn through a gas flame at a speed of about 300 ft. a minute.

MECHANICAL HAND SERVES ALMOST LIKE REAL ONE

By the use of a mechanical hand, a Texas judge, who lost his right arm and part of the left, is able to dress himself, manipulate a knife and fork, drive his automobile and perform nearly all the functions of a normal person. Left in a helpless condition by an accident, the man worked for months to perfect a device which would render him capable of carrying on his personal and business duties. This he succeeded in doing. A leather cap fitted with a metal plate in the end, was made to cover the part of the arm still retained. A clamp device, intended to take the place of fingers, was fastened to the plate. Tied about the arm above the elbow, a string was connected with a small lever controlling a ratchet wheel, which operated the clamp. By bending the arm the string could be tightened to move the lever and work the so-called finger. Other mechanical arrangements then were invented to perform certain specific duties, and these were worked with the assistance of the clamp. In this manner the man was enabled to carry on his regular activities.



With the Aid of This Remarkable Mechanical Hand Its Armless Owner Dresses Himself Unaided

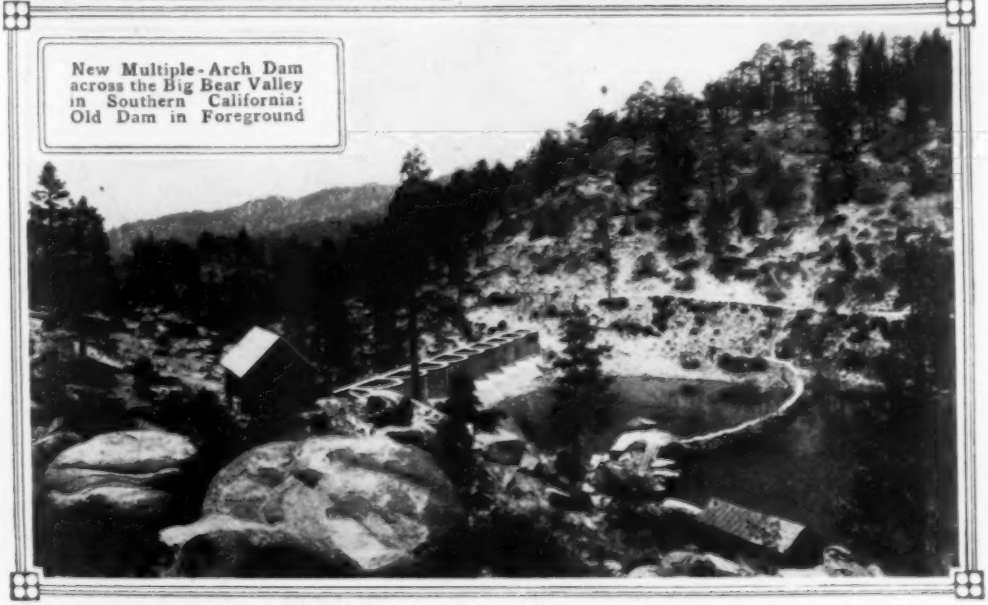
¶The most powerful electric mine hoist in the world, for use in the Transvaal, South Africa, is rated for a continuous delivery of 4,000 hp. and for a part of each trip will travel at a speed of 39 miles an hour.

IRRIGATION DAM OF MOST MODERN TYPE

The reinforced-concrete irrigation dam just completed across the Big Bear Valley, in the San Bernardino Mountains of California, is an interesting example of that modern type of construction known as the multiple-arch dam. This construction consists of 11 thin concrete buttresses, with sides parallel with the stream, which support 10 horizontal arches sprung between the buttresses and curved upstream to resist the pressure of the water. The buttresses are placed 32 ft. apart in a straight line across the valley, while the arches, instead of having vertical faces, slope down and upstream and are thickened at the bottom in order to provide the resistance required for the greater head in the lower part of the reservoir. The total length of the dam is 363 ft. on the crest, while the maximum height from crest to base is 92 ft. The backs of the buttresses, which slope downstream, are tied together by horizontal reinforced-concrete struts designed to stiffen the structure and resist lateral stresses set up by possible earthquakes or vibrations of any kind. Each strut consists of a straight beam which is supported at the middle by an arch sprung between the buttresses. Although the engineers estimate that no damage would be done if the water should overtop the crest, it was thought best to build spillway openings at each end of the dam sufficient to take care of any flood that is likely to occur. Through the bottom of the dam are three 12-in. openings for supplying the water needed for irrigation. The capacity of the reservoir is estimated at 22,800,000,000 gallons.

View of the Dam Showing Footwalk along Crest and Struts to Brace the Buttresses

Dam from the Upstream Side, Showing the Horizontal Arches to Resist the Pressure of the Water



New Multiple-Arch Dam across the Big Bear Valley in Southern California: Old Dam in Foreground

NINETY-FOOT "SUFFRAGETTE" MADE FOR EXPOSITION

Standing 90 ft. in height, the largest "suffragette" in the world has been erected at the Panama - Pacific Exposition grounds as an entrance to one of the amusement concessions. The odd object is wrapped in a long red cutaway coat and wears a white skirt which is provided with a generous slit. The hat, which is modeled after the severe, or militant style, is 7 ft. in diameter and contains material sufficient to stock an ordinary millinery establishment.

COPYRIGHT, PANAMA-PACIFIC INTERNATIONAL EXPOSITION CO.

More than 500 yd. of cloth was used in draping the figure. Forty feet from the ground the exponent of equal rights carries a huge drum, and when completed also will hold a banner bearing the slogan "Votes for Women."

RAILWAY GAUGES OF INDIA AND AUSTRALIA

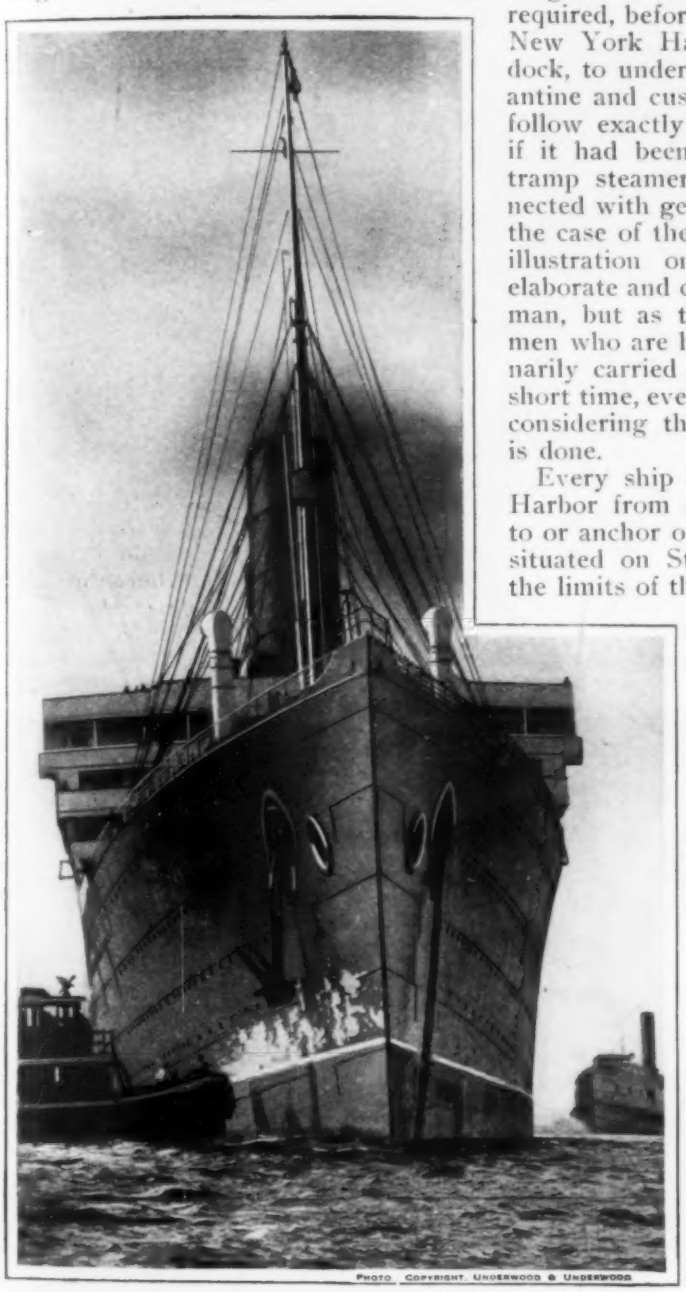
While the railroads of the United States, with the exception of a few feeder lines of minor importance, now have the standard gauge of 4 ft. 8½ in., some countries, less advanced in railroad development, such as Australia and India, still have a variety of gauges that leads to confusion even worse than that which prevailed in this country before a uniform standard was adopted. The 4-ft. 8½-in. gauge was brought to this country from England and is thought to have had its origin in the wheel gauge of Roman vehicles. In any event, this gauge was the one adopted for coal-mine tracks in England, and this led to its adoption as the standard in the building of steam railroads in that country. While many efforts have been made in Australia to secure the adoption of a uniform gauge, the different states have gone on building as was thought to suit best the local conditions, with the result that there are now five different gauges in use in the commonwealth. Of the 17,977 miles of railroads in that country, 4,222 miles have the Irish gauge of 5 ft. 3 in.; 4,014 miles, the standard English and American gauge of 4 ft. 8½ in.; 9,446 miles, a gauge of 3 ft. 6 in.; 122 miles, a gauge of 2 ft. 6 in., and 173 miles, a gauge of 2 ft. It is estimated that the cost of converting to a uniform gauge of 4 ft. 8½ in. would be about $180,000,000. In India, where the adoption of a uniform gauge is also being considered, there are 18,266 miles of standard gauge, 14,750 miles of meter gauge, and about 3,000 miles of 2-ft. 6-in. gauge.

RESERVE CORPS OF AIRMEN FOR WAR SERVICE

While much criticism has been directed against the Federal government because of the weakness of the United States, as compared with other nations, in military aerial equipment, the Mexican situation has served somewhat to stimulate action and direct more attention to flying facilities. The Navy Department a few weeks ago announced that through the work accomplished by a "public-spirited man," who volunteered to organize the Aviation Reserve Corps at his own expense, 58 airmen were ready to proceed to Mexico if called upon. A list of aeroplanes which could be purchased if needed was also prepared and filed with the department.

BRINGING A BIG SHIP INTO NEW YORK HARBOR

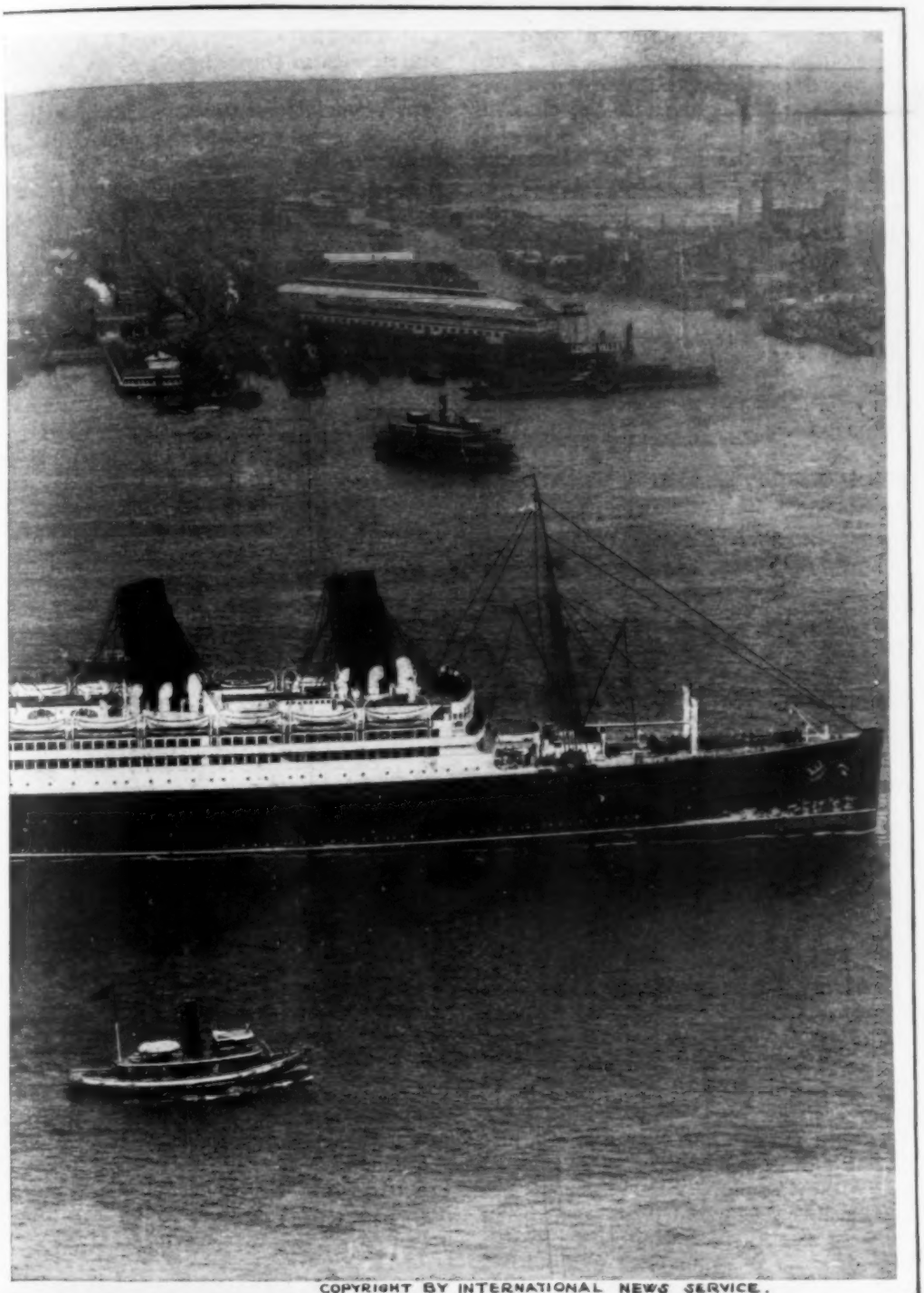
WHEN the new Cunard liner, the 901-ft. "Aquitania," one of the largest and finest ships in the world, finished its maiden trip across the Atlantic from Liverpool with 1,072 passengers on board, June 5, 1914, it was required, before being allowed to enter New York Harbor and tie up at its dock, to undergo the same rigid quarantine and customs inspections and to follow exactly the same procedure as if it had been the most insignificant tramp steamer. The formalities connected with getting into port, of which the case of the "Aquitania" is only an illustration on a large scale, seem elaborate and complicated to the landsman, but as the work is handled by men who are highly trained, it is ordinarily carried out in an astonishingly short time, even with the biggest ships, considering the amount of work that is done.



The "Aquitania" Anchored at Quarantine: The Quarantine Boat is Shown Approaching the Liner from the Port Side

Every ship coming into New York Harbor from a foreign port must lie to or anchor off the quarantine station situated on Staten Island just inside the limits of the Lower Bay, and must remain in that position until it has been inspected and given a clean bill of health by the health officer of the port. One of the rules of the harbor is that the quarantine boat come up to an incoming vessel on the port side. A careful examination is made by the quarantine officers to discover any cases of contagious disease, and if any are discovered, the infected passengers as well as all those who have been exposed are taken to the detention hospital on Hoffman's Island, in the Lower Bay, while the ship itself may be held in quarantine for several days or even weeks, if cholera, yellow fever or other epi-

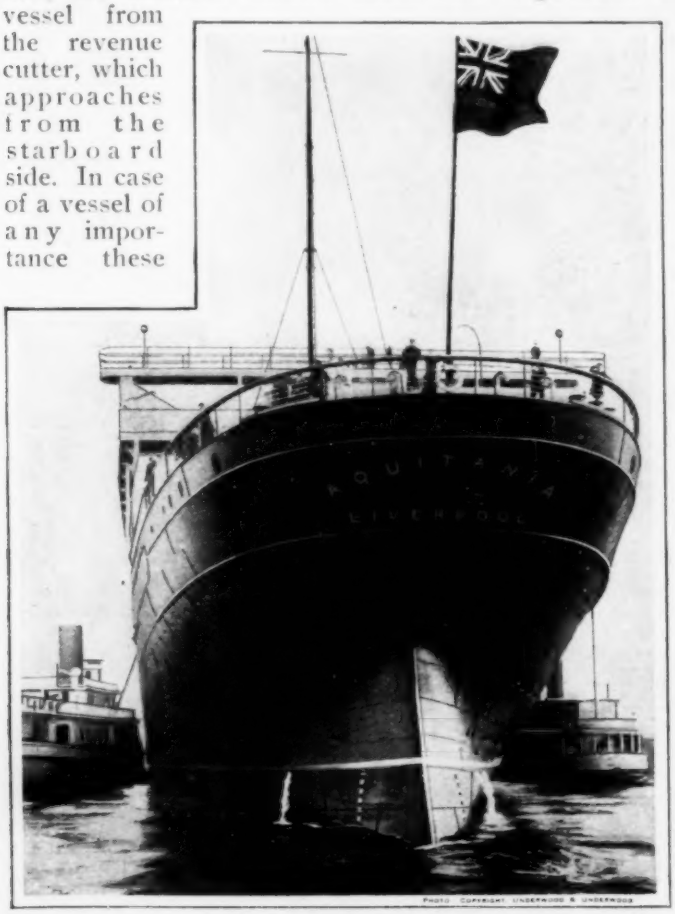
The "Aquitania" Entering the Hudson River on Its Maiden Voyage: The Photograph was Taken from the and Ferry Landing in Jersey City in the Background. The Post-Office Boat, Which Takes the Steam against the Current to Reach the New Chelsea Piers at Twenty-Third Street. Resulted in Materially Augmenting the Swiftness of the Current, Making



Whitehall Building at the Lower End of Manhattan Island and Shows the Communipaw Railroad Terminals
Mails from Incoming Liners, is Shown alongside the Big Ship, Which Still Has Five Miles to
The Lengthening of These Piers and Those at Hoboken on the Opposite Shore has
the Docking of Big Ships Increasingly Difficult, Especially at an Ebb Tide

demic diseases are discovered. Until this examination is finished no person other than the health officers is allowed to board or leave the vessel, the restriction applying even to the customs officers.

As soon as the ship is out of quarantine, the customs officers board the vessel from the revenue cutter, which approaches from the starboard side. In case of a vessel of any importance these officers are accompanied by ship-news reporters representing the daily papers. The ship gets under way immediately and the customs inspection is carried out while the ship is steaming up the harbor to its dock. This inspection consists simply in taking the declaration of each passenger as to whether any dutiable articles are carried either on the person or in the baggage belonging to the passenger, and is done quickly unless the suspicions of the inspector have been aroused by the statements in the affidavit or by information cabled from the government's secret-service agents abroad. Usually the main dining room of the ship is turned into a customs bureau, the dining tables serving as desks for the officers. For a ship like the "Aquitania" with a full passenger list, 40 or 50 revenue officers may be required to complete this inspection before the ship is docked.



Stern of the "Aquitania" with the Propellers in Action Getting the Big Ship under Way after Passing Quarantine Inspection

The last incident before docking is the arrival of the post-office boat, which meets the incoming ship as it enters the Hudson River, takes off all the first-class mail and rushes it to the post office in New York City. The mail transfer is not allowed to interfere in any way with the progress of the ship, as the post-office boat is simply taken in tow and the transfer is made as the ship steams up the river.

How this process was carried on in the case of the "Aquitania" is shown in the accompanying illustrations, where that ship is shown anchored at quarantine, getting under way to go up the harbor, and steaming up the river with the post-office boat in tow. The "Aquitania" arrived at quarantine at 5:30 on the morning of June 5, having made the trip from Liverpool in 5 days 17 hours and 42 minutes, at an average speed of 26.65 miles an hour.

¶A cathedral to cost $150,000 is to be built of reinforced concrete at Georgetown, British Guiana.

DISCOVERING OIL FIELDS BY PHILOLOGY

A French linguist and geographer has suggested a plan to the Academy of Sciences, of Paris, for the study of the native names of localities in the French colonial possessions, with the purpose of finding any indication in the original names of places which seem to signify presence of petroleum deposits. He stated that by this means he had located an oil field in Algeria, in a tract the nature of which would have led no geologist to suspect the existence of petroleum. Several places in Indo-China bear names indicative of oil, according to this scientist, but as yet the localities have not been examined to verify his theory.

SANITARY AND HUMANE DRINKING FOUNTAINS

Sanitary drinking fountains of a new type, that are now being placed in the parks around Washington, D. C., are intended to serve the needs not only of human beings but of birds and four-footed animals as well. There is a constant overflow from the four bubbling fountains, which are supported on slender brackets, and this overflow keeps the large basin just below the fountains filled. In this basin the birds find a drinking and bathing place. The shallow basin at the level of the pavement is kept filled by pipes and is used as a drinking place by dogs, and by the squirrels, of which there are great numbers in the parks. The stand and the basins are of cast iron, painted green, while the bubbling fountains are of porcelain.

ELEVATOR SHAFT OF METAL LATH WEATHERS FIRE

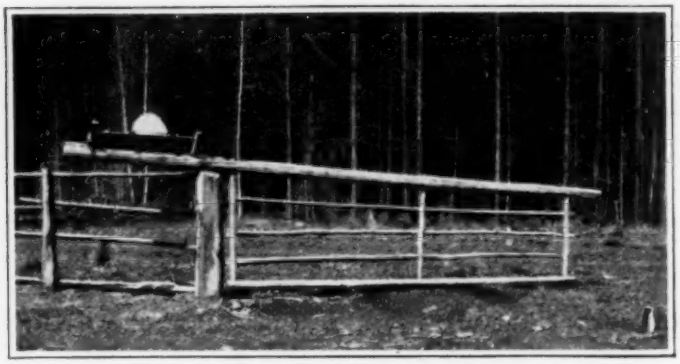
In a heavy fire at Boston, which completely destroyed a large department-store building, the elevator inclosure, the exterior of which was of metal lath and plaster construction, was left standing. The shaft itself was supported by steel beams. Over this the metal lath was placed and the whole plastered on both sides, excepting at the top floor, making a partition approximately 2 in. in thickness. In material contrast with this were some dangling wooden lath, to which clung broken patches of plaster, on a brick wall a few feet from the inclosure. Although the heat was sufficiently intense to crumble brick walls and warp the shape of steel door cases in the elevator shaft, the plastering stood the test. The incident showed the advantage of fireproof elevator shafts in nonfireproof buildings, which would allow the continuance of service in case of fire.

Metal Lath and Plastering Which Withstood Fire Better Than Brick

¶A new railroad ticket is so designed that one form, by a few punches, can be used for 300 different stations.

NOVEL WAY OF HANGING FARM GATE

A simple and ingenious method of hanging and balancing is used by an Idaho ranchman in building his farm gates. The top bar consists of a cedar pole which projects four or five feet beyond the gatepost, and the hinge is simply a long spike driven through this pole into the top of the post. On the projecting end of the pole is a rough box in which one or more stones are placed for balancing the gate. A little care in selecting stones of the right weight and placing them at the right distance from the post produces a balance that permits the gate to swing easily.



A Stone Placed at the Right Distance from the Post Balances This Farm Gate so That It Swings Easily

LARGE FAN USED AS BRAKE FOR MOTOR TRUCK

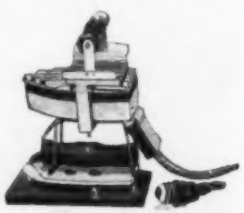
Use of a large fan as a retarder, or brake, is a novelty introduced by a French manufacturer of motor trucks. When the machine is going down a long grade, where the continued application of the hand or emergency brakes might burn the brake lining, the air-stop lever is used. The heavy-bladed fan, horizontally mounted below the body of the truck, is operated by means of a bevel gear in contact with the revolving shaft. Atmospheric resistance to the forward motion of the blades retards the shaft revolutions, slowing or braking the machine.

MOTHER-OF-PEARL INDUSTRY IN AUSTRALIA

One of the most important industries in western Australia is the gathering of pearl shells from the pearling ground that extends for about 600 miles along the coast. The shells are bought by local agents and shipped to London and from them a large part of the world's supply of mother-of-pearl is obtained. For gathering the shells, pearling boats of about 12 tons and known locally as "luggers," are used, while vessels of from 20 to 80 tons are used for storage and transport. The average price paid for shells in London at the present time is about $1,144 per long ton.

ELECTRIC FLUTING IRON LATEST KITCHEN AID

The electric iron now has a counterpart in the electric fluter, by which fine lingerie may be pressed in ruffles. It is composed of an electrically heated stand, with a fluted surface, over which a light-weight fluter with a handle is used as a pressing iron. An adaptation of this device to the ordinary electric flatiron is also shown, whereby the fluting surface has no heating coils of its own, but is clamped upon the surface of the flatiron, which is set upside down on a special stand made for holding it in this position.



¶The Marconi station at Boston recently communicated by wireless with a vessel 8,000 miles away, or one-third the distance around the earth.

COMMENT AND REVIEW

WHEN the individual or a family departs for a summer outing the natural tendency is to leave as many cares behind as possible, and to relax many of the cautionary methods they carefully observe at home. Of these none is perhaps as important as that of drinking water, for many who go out to seek recuperation, return home with a dangerous attack of typhoid. Unsafe food will usually betray itself, but a drinking water that is clear as crystal, and quite palatable, may be full of deadly germs.

Watch the Water

The summer resorter, therefore, will do well immediately on arrival to make a thorough investigation on his own account, and not be content to take the assurance that is so confidently offered. The writer recalls a fishing summer-resort hotel at a lake where the house was an example of neatness, and the lake clear and deep. An examination, however, disclosed a gas engine busily at work pumping from the lake and only 20 feet away all the sewage and waste water from the place as busily returning to its original source. When questioned, the manager was positive no harm could result because the lake was deep near shore and the wind frequently stirred it up.

Wells especially are suspicious propositions, as underground streams often carry a considerable distance, even when surface drainage is apparently taken care of. In all cases of doubt it is much safer to insist on boiled water, which when cooled is not very objectionable as to taste, and is much safer.

The city dweller is, moreover, less immune to many risks the person living an outdoor life constantly might successfully resist.

In seeking health be sure you don't find sickness.

THE get-rich-quick swindlers are by no means confined to the vicinity of Wall Street; every other large city has them, and some try to disarm suspicion by operating from quite small cities. They are smart, shrewd schemers—they have to be to keep out of jail. Their appeal is not to the man of means, for he is a careful student of investment, and has usually learned by losses and experience that one cannot get something for nothing. It is the inexperienced, hard-working, carefully saving person who is trying to educate his children and get ahead, that is tempted to take what seems a perfectly safe chance.

Safety-First Investments

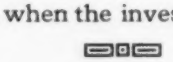
These words of warning are offered at this time because the signs point to big crops and a recovery in business enterprises very soon. With returning prosperity always comes a relaxation in caution in money matters; it is in the air. Such periods are the harvest time for the mail-order get-rich-quick men. Their plans are already worked out; even the printed matter is ready. Millions of envelopes with their seductive contents are addressed, and only wait the favorable

moment and a stamp to begin their flight to every corner of the country. It is easy to get the list of names from concerns whose business it is to compile them, and for a few dollars anyone can purchase thousands of addresses of men in any desired occupation, ministers, blacksmiths, barbers, bankers. Hundreds of those who read these lines will doubtless receive some of these baits, so cleverly written as to appear absolutely innocent and reliable. The name on a board of directors, of some man of national reputation, by no means insures the success of a project which may be ever so honestly planned, but for practical reasons doomed to failure. To the loser there is little ultimate difference between a clever scheme dishonestly managed and an honest scheme unsuccessfully managed.

The fishing always looks better on the opposite bank, and an investment located a thousand miles away tempts where the same identical proposition at home would wholly fail to interest. From a distance only the golden colors of success are visible; viewed close enough the same picture becomes a rank daub.

For the man or woman who has not had a successful experience in investing, the safe plan is to consult some good banker in your own town. This will not cost you anything, and while bankers are not infallible, and occasionally one is even dishonest, is it not better to take advantage of his experience, which will be gladly given, than to jump in the dark?

Look out for sharks when the investing season opens!



Sea Telescope Needed

ARE we becoming immune to horrors? It would almost seem so, for while the "Empress of Ireland" loss of life was over 1,000 the event caused only a fraction of the excitement incident to the "Titanic." One reason doubtless was that in the former the full loss was known in a few hours and the public realized it knew the worst, while in the other there was an uncertainty for several days. Even at that, it does not seem possible that so great a disaster could occur and make so passing an impression.

Whatever the finding of the court of investigation, the one thing which cannot fail to impress the citizen and passenger is the degree of danger due to fog. This, too, in spite of foghorns and sound receivers above water, and submarine telephones below. Apparently the only safe rule at present is for all moving craft to come to a standstill until the fog lifts. Some newspaper publicity was obtained by an inventor in England who claimed a device making objects discernible through 13 miles of fog. Unfortunately, there seems little to be hoped for in this, as the electrical associations pronounce the claims misleading and unsuccessful.

Probably no other one thing is so urgently needed at sea as some device or process which will enable a lookout to penetrate fog for even the distance of a mile. Such an inventor would be second only to Marconi in the heart of the sailor, and would remove from sea travel one of its greatest present risks. Such an invention would be a worthy monument to any man.

Langley's Folly Vindicated

MANY an inventor has conceived a great idea, spent the best years of his life in an effort to produce a tangible demonstration, and, laughed out of life by the unthinking mass, has died a crushed and heartbroken wreck. Such was the pathetic experience of Dr. Samuel Langley, for years secretary of the Smithsonian Institution, and a scientific man whose qualifications and views and judgments commanded great respect. In all respects but one was this true. When he dreamed, then drafted and finally designed, a heavier-than-air flying machine, even his intimate friends and ardent admirers, for the most part, made no effort to conceal their unbelief. Few of them could understand his painstaking calculations of twenty years, and refused to credit because in their ignorance they could not comprehend.

Like most great scientific men his life was devoted to science, not to money making. Only after years of personal pleading did our Government appropriate a mere pittance to permit a trial of his ambitious plans and hopes.

The story of his two unsuccessful attempts are well known, and the cruel criticisms and derision which swept the press of the entire country still echo from the past. And Langley, living the quiet life among his specimens and sciences, and unaccustomed to the hard buffeting which only spurs the modern business man, was crushed, and passed away in sorrow.

Years passed and the sight of men flying over land and sea had become a familiar one in many countries. Then it was an old friend and admirer, Doctor Zahm, and a Knight of the Air, Glenn Curtiss, thought to vindicate his name. The old machine which had been on exhibit was taken from the Smithsonian Institution. Only a few repairs were necessary; the cloth which formed the planes had rotted and parted at a touch, but the framework, seasoned with years, was as strong as ever its builder's hopes had been. Even the old engine was not replaced. The machine was once more as Langley made it, with one slight exception. Pontoons weighing 350 pounds were placed where runners had been, for Langley erred in catapulting his machine into the air, instead of letting it climb there of itself.

On the day of the test Curtiss reverently took his seat in the lost hope, floating on the surface of Lake Keuka; the throttle was opened; the engine awoke from its dreams and responded; the propeller again beat the air; the spirit of Langley returned to the child of his brain and hands; and, released from its long sleep, Langley's Folly, now Langley's Flying Machine, found its own and soared.

There were no spectacular "stunts," no loops, nor any other of the thrilling wonders of a Beachey. They were not necessary. Langley was at last vindicated and now sleeps in peace.

June 30, 1914. H. H. WINDSOR

CANAL BETTERS SANITATION AT RIO DE JANEIRO

Conditions in the "East End" at Rio de Janeiro, Brazil, where the land is rather low and swampy, have been

This Picturesque Waterway Aids Sanitation at Rio de Janeiro

made much more nearly sanitary by the recent construction of a broad canal. This drains the marshy ground and acts as an outlet for the torrents of water which often rush down upon the lowlands from the surrounding hills, following freshets. The canal stretches down the middle of the Avenida do Mangue and is flanked by double driveways. Rows of stately palms line the banks, which with the romantic surroundings make the place picturesque and beautiful.

¶The new German naval dirigible "L 3" recently made a 34-hour flight at a speed of nearly 60 miles an hour.

CLOTH IN SCHOOL WINDOWS INSTEAD OF GLASS

Screens made of unbleached cotton cloth have recently been used in the place of glass windows in schoolrooms. The doors and windows are closed and warm air blown into the schoolroom before the pupils arrive. While the school is in session the windows are thrown wide open and the cloth screens substituted. Cold, fresh air filters in through the cloth from the outside so slowly that it is warmed and circulated properly by the warm air previously admitted, and the cotton, not being so good a conductor as glass, does not permit the interior heat to be radiated out. The humidity of rooms ventilated in this way remains about the same as that of the outdoor air, but the amount of dust found in the schoolroom air is shown by test to be about 33 per cent less, and, so long as the cotton is kept reasonably clean, the lighting effect is good. The simplicity and cheapness of the cotton screens make the plan available to any school.

JUNIPER WOOD TO REPLACE CEDAR FOR PENCILS

After a long series of experiments, conducted with the coöperation of four large manufacturers, the Forest Service of the Department of Agriculture has reached the decision that juniper is the most available substitute for red cedar for use in pencil making. In pursuance of this, arrangements are now being made, by some of the largest companies, for lumber rights in the juniper lands in New Mexico and other places. The present output of pencils in this country amounts to 1,000,000 daily, while it requires 7,000,000 cu. ft. of wood a year to allow for this production. The Forest Service and the manufacturers have been worried for some time over the lumber situation, as the supply of cedar is diminishing rapidly. Hard woods could be used but for the fact that few pencil users ever carry sharp knives.

One of the Fog Guns in the Firth of Clyde: This Gun is Set Going and is Stopped by Wireless Waves

Wireless Station That Controls the Operation of Automatic Acetylene Fog Guns

FOG GUN STARTED AND STOPPED BY WIRELESS

A system of wireless control that is now being applied successfully at several points in Scotland seems to have solved the problem of distant control of acetylene fog guns located at points difficult of access, and provides a means by which a number of such installations may be operated from one wireless station without the necessity for visiting the different signals, except for making repairs and replenishing the supply of gas. The gun to which this control is applied is the one, with slight modifications, that was described and illustrated in the July, 1914, issue of this magazine. When started, it automatically feeds and fires itself at regular intervals until stopped or until the supply of acetylene runs out, and the wireless control simply provides a means of starting it when there is a fog and stopping it when the fog clears, without going near the signal. Furthermore the wireless apparatus is so arranged and tuned that it is not interfered with by the more powerful waves that may be sent out by passing ships or by other wireless stations. The control waves are sent out by an ordinary wireless station of rather low power, while the waves are received at the fog gun by four short aerials. The electric impulses then pass through a special form of coherer to a relay which is very sensitive but has a large movement and is therefore capable of keeping in adjustment under all temperature conditions. From the relay the impulses pass alternately to two synchronizers, each of which is connected with one of two electromagnets that control a needle valve in the outlet of the acetylene tank. When one of these magnets is energized it opens the needle valve and causes the gun to begin and continue feeding and firing itself automatically, and when the other magnet is energized the valve is closed and locked, shutting off the supply of acetylene and therefore stopping the operation of the gun.

THIRTY-ONE POUNDS WEIGHT OF SWEDISH COIN

Weighing 31 lb., a single copper coin bearing the imprint of the Swedish crown and the name of the monarch, Charles X Gustavus, during whose reign it was issued, has been acquired by the American Numismatic Society. The piece represents eight "daler," equivalent to $5.20 in American money. It measures 23½ by 13 in., and in form is a rectangular ingot bearing five large stamps punched in the center and four corners. These impressions were made in order to prevent a reduction in value by clipping. The coin was struck at Avesta, Sweden, in 1659, and is of a type which was minted continuously for 110 years, although the eight-daler plates were issued only a short time and are now quite rare. This specimen was dredged out of the harbor at Riga, Russia. Large-sized coins of this type were first brought out in 1649 during the reign of Christina, the daughter of Gustavus Adolphus. The object was to form an outlet for the products of the country's copper mines without depreciating the value of the metal.

One of the Largest Coins in the World, Weighing 31 Pounds

¶Through a recent decree, Uruguay has adopted the 24-hour day.

SINKING OF PARIS STREETS DURING RAIN STORM

Sections of some of the most important streets in Paris collapsed without warning and, according to reports, more than twenty persons were killed, as the result of a rain storm of phenomenal violence that swept over that city on the evening of June 15, 1914. The most serious cave-in occurred at the junction of the Rue de Boetie and the Faubourg Saint Honoré, where more than 500 sq. ft. of the paving heaved and sank, carrying with it a number of persons that had taken refuge under the awning of a café. At several points in the city a number of persons were killed and much damage was done by gas explosions caused by the breaking of the gas mains. To a greater extent than any other city in the world Paris is undermined by a labyrinth of excavations, including the ancient and deep excavations known as the catacombs, sewers, ancient and modern, and numerous subways. The collapse of the streets is attributed to the weakening of the underlying soil and rock by recent floods and particularly by the great flood of 1910. The June storm itself lasted but three hours.

TRANSATLANTIC FLYING BOAT READY FOR ITS GREAT VOYAGE

By A. F. ZAHM, Ph. D.

Secretary of the Langley Aerodynamical Laboratory of the Smithsonian Institution

[Not since the Wrights made their first public aeroplane flights has interest in aviation been so aroused as by the preparations for the first attempt to cross the Atlantic in a heavier-than-air flying machine. As soon as it became certain that the attempt would be made this year, Popular Mechanics Magazine commissioned Dr. A. F. Zahm to observe and report on the preparations for the flight to Europe, which probably will have been begun before this magazine is in the hands of its readers. Dr. Zahm's lifelong study of aviation, the results of which are embodied in his book "Aerial Navigation" and many scientific treatises, qualifies him as perhaps the foremost American authority on the subject. He spent several weeks at Hammondsport observing the construction and tests of the transatlantic flier.—Editor.]

EARLY last February Mr. Rodman Wanamaker unfolded his audacious scheme, long ruminated and now mature, to bridge the Atlantic by aeroplane. He had closed with Mr. Curtiss, the hydro master, for a craft to win the Lord Northcliffe prize for the first flight from the New World to the Old within 72 hours. Preferably two men should drive her from Newfoundland to Ireland between dawn and dark on a summer's day. But on this condition he would not insist; for even with no restriction the enterprise seemed sufficiently difficult, if not hazardous. The details he would leave to Mr. Curtiss and his technical associates.

Once taught the air lane, whole fleets of ocean fliers would promptly follow. Live fellows in New York would flit to London Friday nights, and, after Sunday's dinner, flit back to business. This metropolitan propinquity should assimilate and unify all peoples. War should be forgotten. The globe so shrunk should at length crib but a single homogeneous family, forever tranquil and prosperous. So figured Mr. Wanamaker. The generous optimist would hasten the millennium.

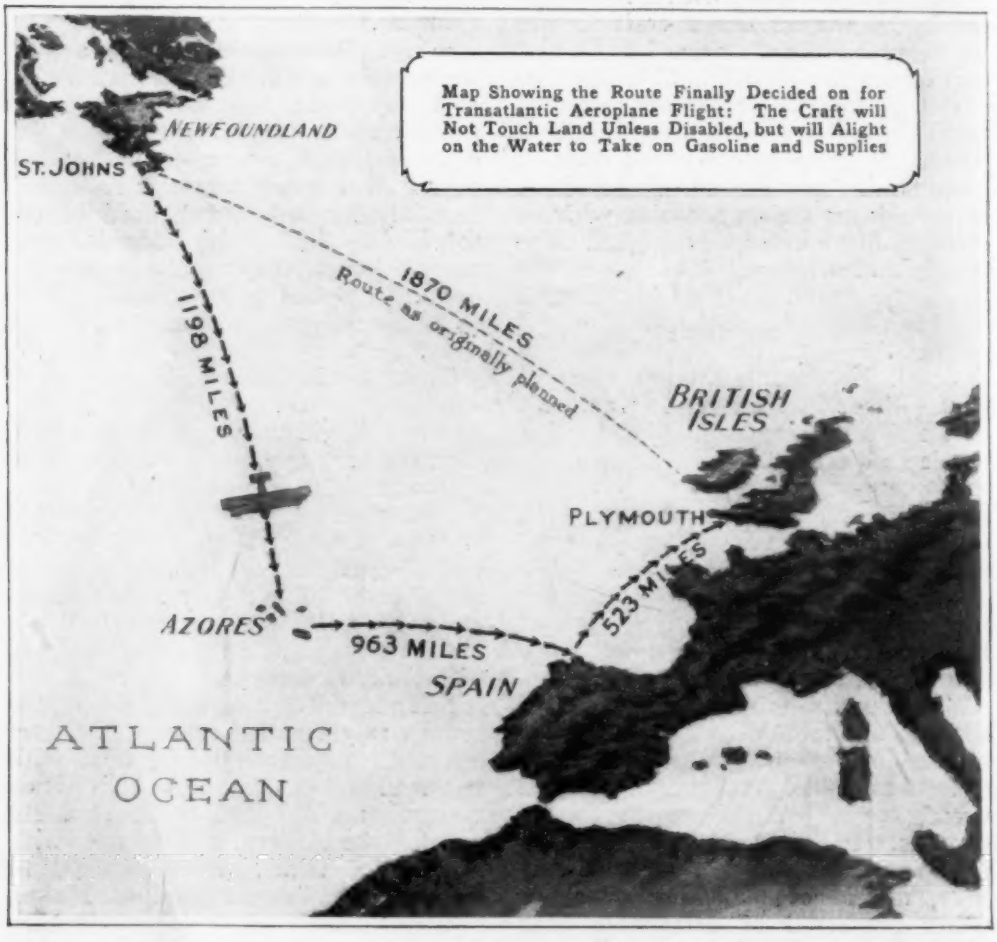
Mr. Curtiss, though accused of angling for money and notoriety in countenancing an impossible enterprise, was really much in earnest and already engrossed in constructive preparations. His first conception was a 200-hp. tractor biplane, of whalelike body, devoid of launching gear; or rather possessed of detachable gear which should drop behind at launching. This winged projectile was to mount aloft two miles, take the easterly drift blowing 50 miles an hour, and sweep for Ireland over a great circle, at 110 miles an hour. With steady speed and good fortune the 1,800-mile course would thus be covered in 17 hours' continuous flying. The two pilots would take fuel and oil for over 20 hours, and rations for several days. In case of stoppage en route, they could not resume flight, but could detach the wings, then voyage by aid of a water screw at the stern. Comfortably fed and housed in the torpedolike hull, with closed transparent hood, they could scout the ocean till picked up by a passing ship, or by special sea craft assigned to that duty.

The idea of soaring meteorlike from continent to continent, without stop and in a single summer's day, had Mr. Wanamaker's approval and the world's applause. The project was magnificent if somewhat venturesome. Impossible it could not truly be called; for had not a German recently flown 16 out of the 17 or 18 hours required for a favorable voyage? The chances seemed fair for the voyage, fair for rescue in case of premature descent.

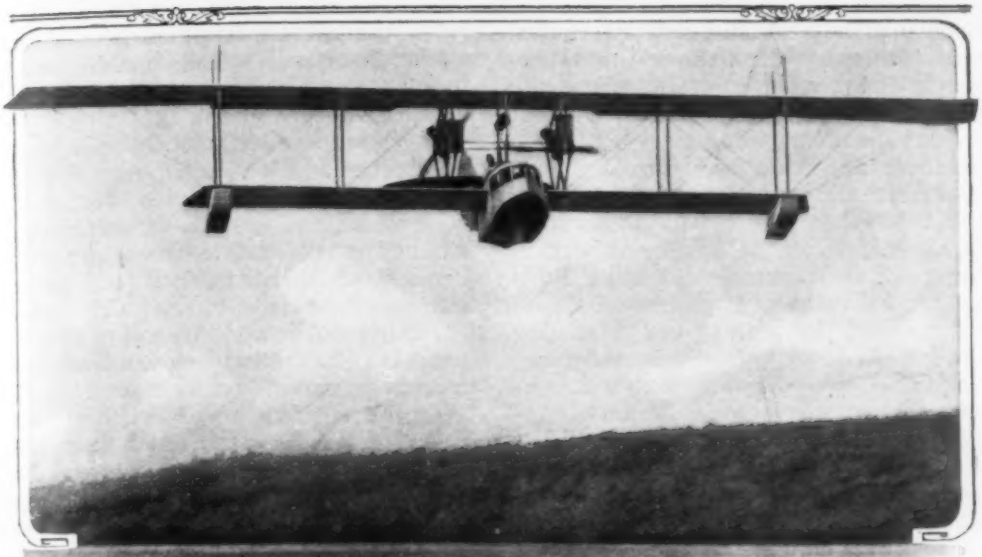
But a less dramatic, less difficult program was presently proposed and soon adopted. A stanch flying boat with two men and gasoline for a continuous voyage of a day and a night should sail for the Azores, and thence, with replenished tanks, sweep straight to Europe. The longest stage would thus be under 1,200 miles, or very little more than the world's record for a nonstop flight of one man in a land aeroplane. It would be feasible to alight at any

moment on the sea, except in a considerable storm, make adjustments of the propelling system, and proceed without impediment. So, after mature counsel with their confidential associates, Mr. Wanamaker and Mr. Curtiss agreed upon this second plan, and determined to push the work to a finish as early in the summer as practicable.

Aside from the technical staff of the Curtiss Aeroplane Company, the person most closely associated with Mr. Curtiss in working out the details of design, construction and navigation of this over-sea flier was Lieut. John Cyril Porte, R. N., retired lieutenant of the British Navy. The Langley Aerodynamical Laboratory Committee had indeed, through its chairman, offered Mr. Wanamaker its services and laboratory facilities. Mr. Curtiss, himself a member of this committee, discussed his plans with one or two of the other members, and received their suggestions. But as the proposed vessel was not a radical modification of his well-known boats, he did not seem to need further scientific investigations than could be made in his own establishment. Practical tests of motors, materials and structural parts he could

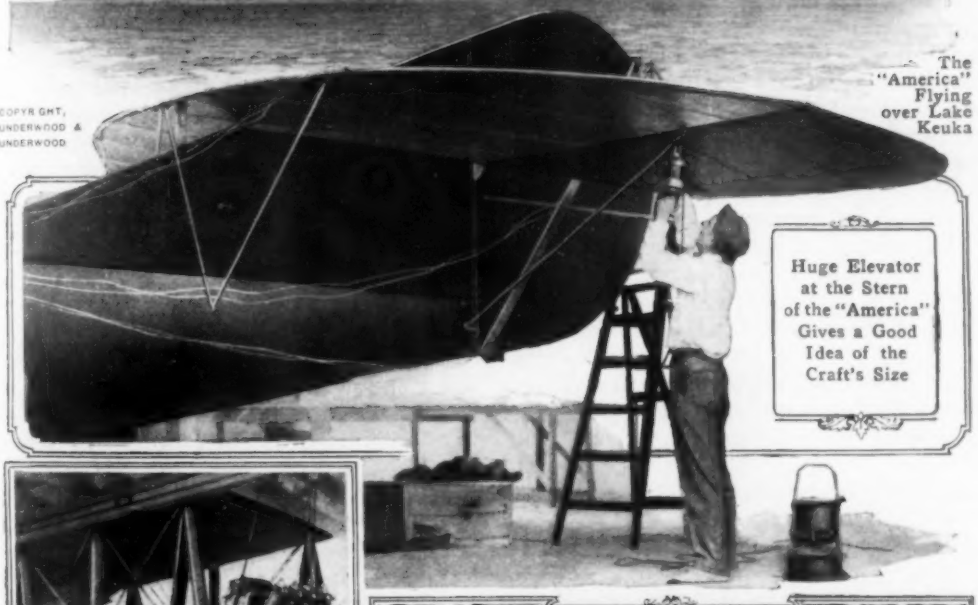

Map Showing the Route Finally Decided on for Transatlantic Aeroplane Flight: The Craft will Not Touch Land Unless Disabled, but will Alight on the Water to Take on Gasoline and Supplies
NEWFOUNDLAND
ST. JOHNS
1870 MILES
Route as originally planned
1198 MILES
BRITISH ISLES
PLYMOUTH
523 MILES
AZORES
963 MILES
SPAIN
ATLANTIC OCEAN

As this map shows, the route to be covered is nearly 2,700 miles long. The course leads immediately over the ship lanes, making it possible for the airmen to be advised of their position by reading signals flown for them by passing liners. Instead of a wireless outfit, smoke bombs, rockets, and carrier pigeons will be used for signaling and communication.

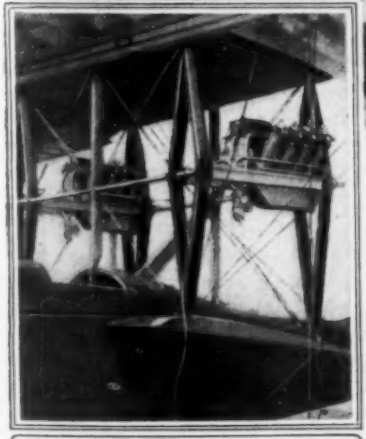


The "America" Flying over Lake Keuka

COPYRIGHT, UNDERWOOD & UNDERWOOD



Huge Elevator at the Stern of the "America" Gives a Good Idea of the Craft's Size



The Two 90-Horsepower Engines Suspended between Upper and Lower Planes

The "America's" Inclosed Cabin: Ten Passengers Were Carried in Trial Flight

COPYRIGHT, INTERNATIONAL NEWS SERVICE

readily make at home, and did make; but elaborate wind-tunnel measurements of the most favorable shapes he could not wait for and might, without serious handicap, forego.

Lieutenant Porte agreed to be the responsible pilot and navigator on that uncharted voyage—the Columbus so to speak—aided by an aviator expert in engines, and preferably skilled in marine navigation. Porte was both an experienced sea-planer and a trained navigator of ships. Besides conferring frequently with the designers and constructors at the factory, he must consult sea and weather experts to learn everything possible about his sailing conditions; he must negotiate with officials of governments, clubs and steamship companies to secure relief or information en route; he must foresee all possible difficulties of the voyage and obviate them or adequately provide against them.

The sea flier as finally built looks like a resplendent red whale with biplane wings jutting out from its sides. The forepart of the hull is the cabin with closed turretlike hood, having celluloid windows around and above it to give clear view of the world, the sky, and the craft itself. The rear tapering part of the hull carries the tail plane and rudders exteriorly, and interiorly is composed of water-tight compartments. The central part of the hull contains the gasoline tanks from which the fuel is pumped up to the smaller supply tanks situated beneath the upper plane. The air boat measures 72 ft. across its upper plane, 46 ft. across its lower, 34 ft. from stem to stern, where the vertical rudder is hinged, spreads about 780 sq. ft. of winged surface, weighs, with two men and supplies for a 1,200-mile voyage, about 5,000 lb., is propelled by twin screws driven by two 90-hp. engines placed between planes, on either side the plane of symmetry, and is designed to fly at 60 to 63 miles an hour for about one day and night continuously. The details of construction are multitudinous, ingenious, novel in part and carefully calculated, and finally tested by systematic experimentation. Only a portion of such details can be given here.

The structure of the hull resembles that found in standard light-boat architecture. The skeleton is framed of the usual stringers, ribs, keel, etc., made chiefly of spruce. Over this is fastened, with brass screws, one skin of quarter-inch spruce laid lengthwise with a slight rise toward the stern. But under the bow the skin is of double thickness with closely woven linen between, saturated with marine glue. Over the entire skin of the hull two layers of the glue-saturated linen are placed, one lengthwise, the other spirally, and both ironed hot, then painted. The bottom of the boat has the usual Curtiss hollow V-bottom in front terminated by a step just aft the center of gravity, to allow the craft to glide over the water easily and to rise without downward suction. The hull is of 4-ft. beam, and measures 4 ft. from the keel to the top of the bow, 6½ ft. to the top of the hood. Within this large slipper-shaped part the two men sit on a cushioned bench athwart the cabin, the controls before them, the navigating instruments all about on the walls, shelves, or brackets. The extreme prow is sharp vertically, to split the waves; the extreme stern is a vertical edge terminating the whale-like tail, of oval section.

The wings in outward appearance resemble at a distance those of the usual Curtiss air boat, except that two engines mounted on huge crutch-shaped posts on either side of the mid section, make a combination that looks from afar like two men standing between the upper and lower planes. On nearer view, it is seen that the wing contour is that of the most efficient and practical surface developed in the aeronautical establishments of Great Britain. Everywhere except in the engine section the planes measure 7 ft. wide, are practically flat beneath, have elastic rear edges, firm-rounded, thick front edges of the Phillips type, convex upper surface 6 in. in depth of arch at one-third the distance from the

front edge. They are framed chiefly of spruce and consist interiorly of two main spars of I-section supporting ribs 14 in. apart, the whole trussed with cross sticks and stout piano wire. Over this framing on both sides is tautly stretched Japanese silk, thoroughly impregnated with a preparation to make the fabric air-tight and waterproof. The upper and lower planes are trussed together with hollow spruce posts of streamline section, diagonally tied with steel cables adjusted with turnbuckles. Scow-shaped floats under the wing tips preserve the craft from rolling on the water.

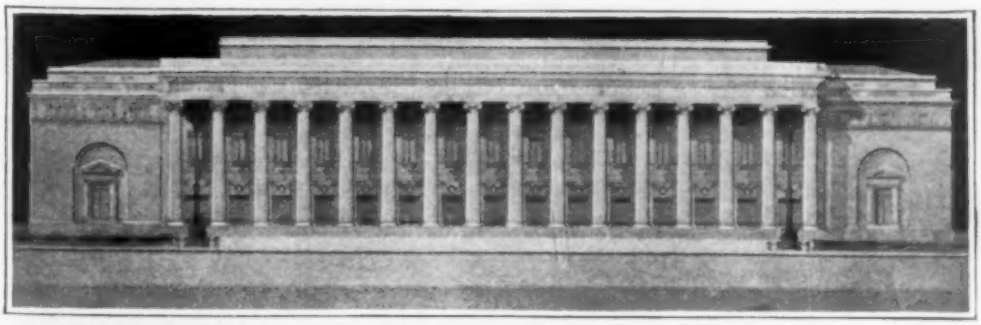
The control system closely resembles that of Mr. Curtiss' "non-infringing" aileron system. The ailerons at the rear of the wing tips turn only upward, one at a time, to press down the wing if too high. The tail unit mounted at the stern consists of an adjustable tail plane, a vertical fixed fin, a vertical rudder and a pair of horizontal rudders or elevators. The whole combination may be operated with the usual Curtiss controls moved in the usual way, unless the pilots decide to work the ailerons with their feet, as being more powerful than their hands, and less liable to fatigue on a long journey.

The double-propulsion system comprises two Curtiss motors of 90 hp. each directly connected to two-blade propellers, two magnetos, two carburetors, two radiators each having 100 ft. of cooling surface and presenting 2 sq. ft. of front. Each engine, with accessories, is independent of the other, and is provided with its individual tachometer, or revolution counter, mounted on the inner cabin wall, so that the pilot can make the two motors run at about the same speed. Should one motor stop, leaving the other to exert an unbalanced propeller thrust, this could be counteracted by turning the rudder so as to guide the craft on a straight course.

The individual weights are nearly as follows: Hull alone, 600 lb.; gasoline and tanks, 1,900 lb.; oil and tanks, 230 lb.; motors, 690 lb. aggregate; men, 300 pounds.

MEMORIAL TO WASHINGTON IS DECIDED UPON

Plans have been accepted for the George Washington Memorial Building which is to be erected on Armory Square at the national capital, where it will serve both as a monument to the first president and also as a gathering place for those interested in the advancement and betterment of mankind. It is promoted by the George Washington Memorial Association, and will cost approximately $2,000,000, which amount is being raised by popular subscription. When completed it is expected to serve as the headquarters of many patriotic, scientific and educational organizations. In dimen-



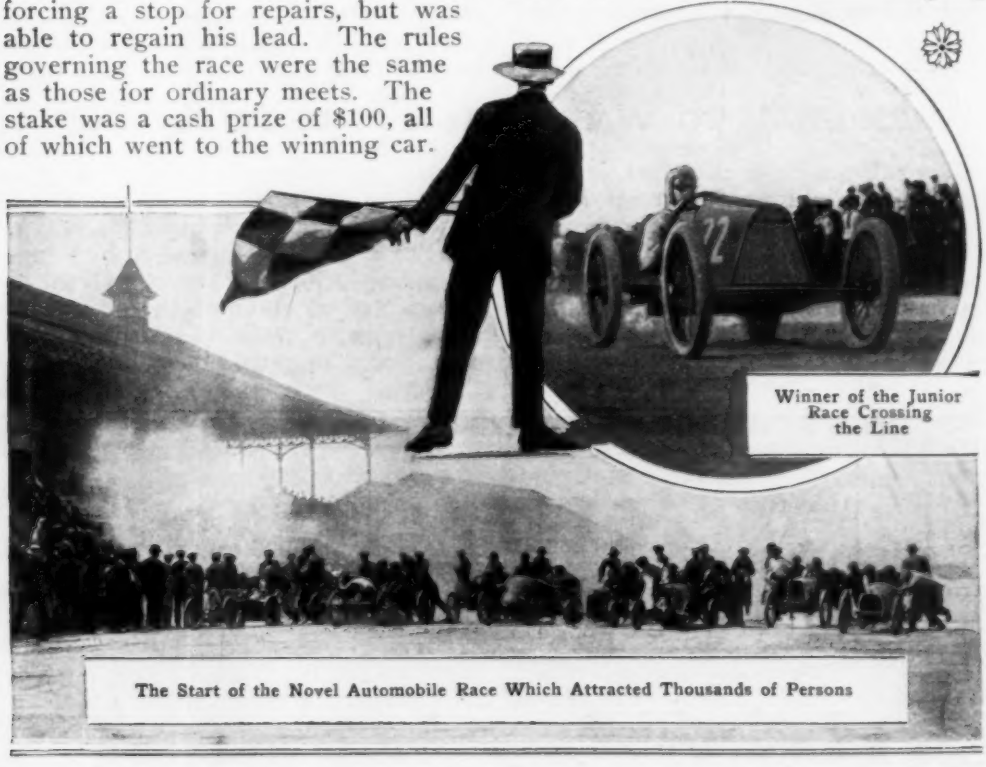
TRACY & SWARTWOUT, ARCHITECTS

Washington Memorial, Which Its Architects Declare is an American Type of Design

sions it will be 300 ft. in length and have a depth of 350 ft. A façade of 16 heavy Doric columns, 48 ft. in height, will extend across the front of the structure. The auditorium, which in accordance with modern acoustic theories will be elliptic in form, will seat 6,000 persons. Seven smaller halls will accommodate between 250 and 1,000 persons each.

JUNIOR AUTO RACE IS RUN ON PACIFIC COAST

Nearly fifty contestants entered the junior sweepstakes automobile race which was run at Los Angeles on last Decoration Day. Only young men under 19 years of age, who had constructed their own machines, were privileged to drive in the meet, which was watched by a crowd of nearly 12,000 persons. Most of the miniature cars, several of which closely resembled real racing motors, were fitted with two-cylinder motorcycle engines. The average speed at which the machines were run over the 40-mile course was 30 miles per hour. The winner of the event suffered an accident which broke his driving chain, forcing a stop for repairs, but was able to regain his lead. The rules governing the race were the same as those for ordinary meets. The stake was a cash prize of $100, all of which went to the winning car.



Winner of the Junior Race Crossing the Line

The Start of the Novel Automobile Race Which Attracted Thousands of Persons

HOLE TORN IN LINER'S SIDE BY COLLISION IN FOG

An ugly hole was ripped in the port bow of the transatlantic liner "New York" when it was rammed recently by the "Pretoria" during a heavy fog off the coast of Nantucket. At the time of the accident, neither of the vessels was moving at full speed. While the rent torn in the side of the boat was large, it was fortunately above the water line. Had either of the ships been under full headway, a repetition of the "Empress of Ireland" disaster might have occurred. Protruding through the torn steel of the "New York" was the shank of the "Pretoria's" anchor, which was responsible for the damage, and dangling

COPYRIGHT UNDERWOOD & UNDERWOOD

Repairing the Liner "New York" After It had been Rammed by the "Pretoria"

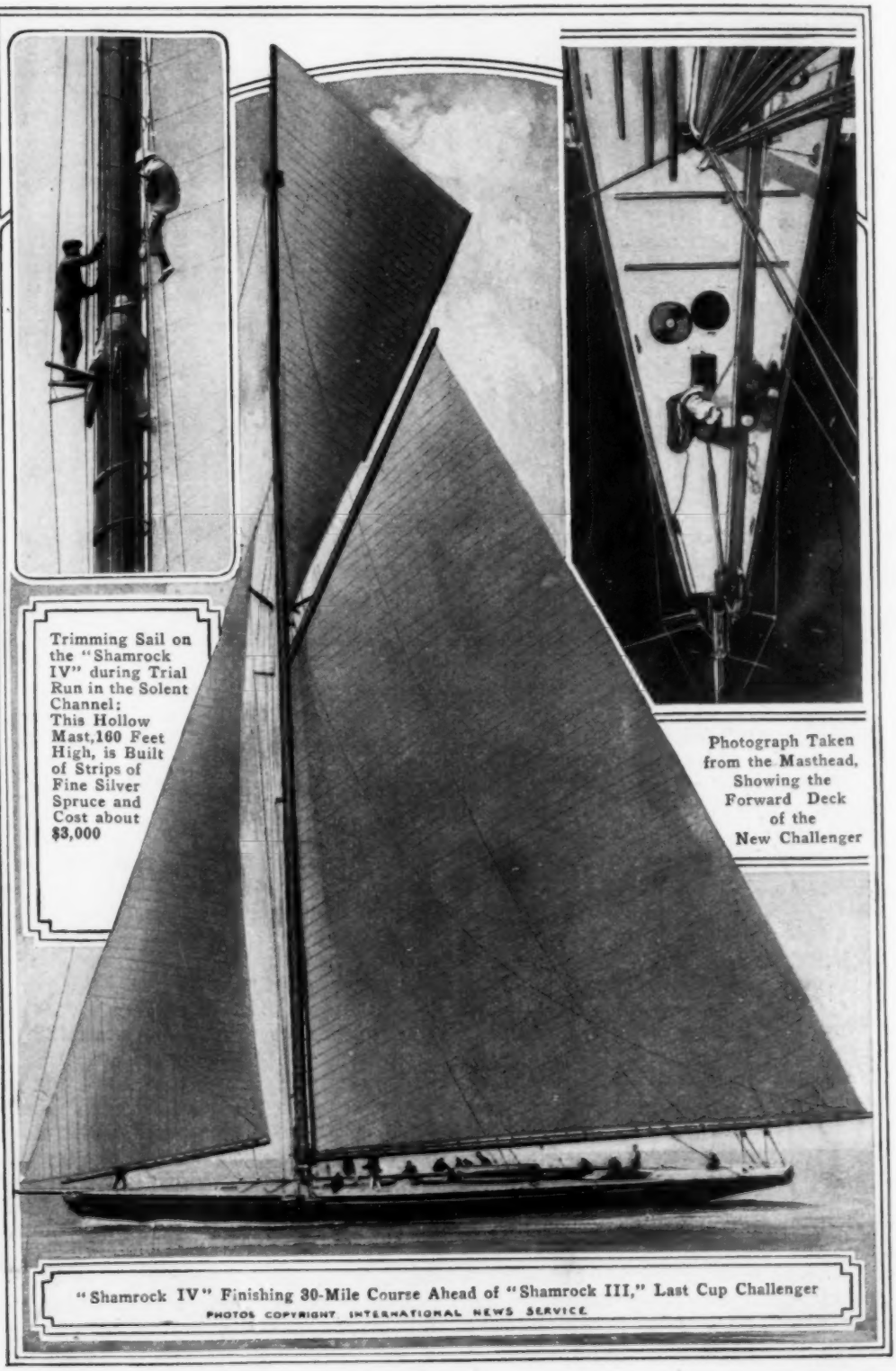
from it several links of its heavy cable. The vessel was taken into port at New York where it was turned over for repairs. The work of covering the great wound was accomplished in a few days by removing the ragged plates and riveting new ones in their places.

AEROPLANE ESCORT AT FUNERAL OF AIRMEN

Flying mourning flags and manned by airmen of several nations, 20 aeroplanes acted as escort and guard of honor at the funeral of the nine military airmen killed in the collision of a biplane and the dirigible "Koertling" during the Austrian army maneuvers on June 20, 1914. During the progress of this, one of the strangest funerals ever known, the biplanes circled round and round the cemetery and at the conclusion of the ceremony flew away in company. The disaster in which these airmen lost their lives is an example of what will probably be one of the common incidents in wars of the future. The "Koertling" had ascended to take photographs of the soldiers below and then to join in the maneuvers. Half an hour later the biplane ascended and began a sham attack on the dirigible. After circling around the "Koertling" several times the pilot of the biplane suddenly maneuvered his craft, apparently with the idea of taking a position directly above the airship, but owing to some miscalculation the nose of his machine grazed the gas envelope of the airship and ripped it open. An explosion followed and both craft, enveloped in flames, fell with their occupants to the mountain slope 1,500 ft. below. The bodies of the victims were so burned and mangled as to be scarcely recognizable.

¶Sidewalk tile is being made in Florida of brick screenings from old paving bricks. The entire cost of making is five cents each.

THE NEW CHALLENGER FOR THE "AMERICA'S" CUP



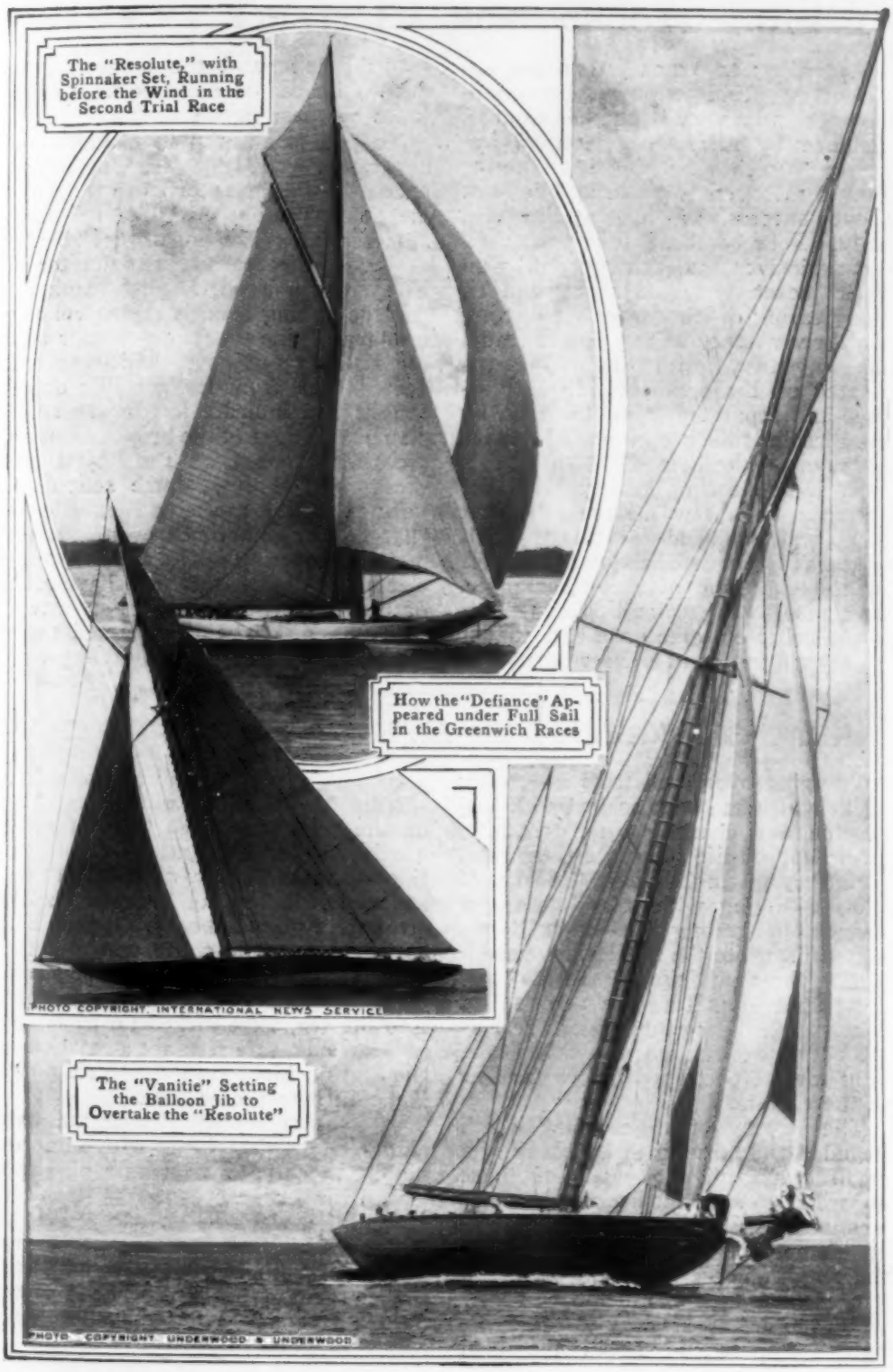
Trimming Sail on the "Shamrock IV" during Trial Run in the Solent Channel: This Hollow Mast, 160 Feet High, is Built of Strips of Fine Silver Spruce and Cost about $3,000

Photograph Taken from the Masthead, Showing the Forward Deck of the New Challenger

"Shamrock IV" Finishing 30-Mile Course Ahead of "Shamrock III," Last Cup Challenger

PHOTOS COPYRIGHT INTERNATIONAL NEWS SERVICE

ONE OF THESE YACHTS WILL DEFEND THE TROPHY



The "Resolute," with Spinnaker Set, Running before the Wind in the Second Trial Race

How the "Defiance" Appeared under Full Sail in the Greenwich Races

PHOTO COPYRIGHT, INTERNATIONAL NEWS SERVICE

The "Vanitie" Setting the Balloon Jib to Overtake the "Resolute"

PHOTO COPYRIGHT, UNDERWOOD & UNDERWOOD

BOMBS EXPLODED FROM A DISTANCE BY F-RAYS

According to reports that are apparently well authenticated the explosion of mines and bombs from a distance by means of electrical impulses which the inventor terms F-rays, discovered by Giulio Ulivi, has proved successful in tests at Florence, Italy. Four bombs, loaded with various explosives and each covered by an inner jacket of tarred string and an outer casing of iron, were set floating in the river Arno. When all was ready, the inventor, with his apparatus located on the opposite side of Florence and separated from the Arno by the Fiesole Hills, began searching with his rays for the bombs, which by this time were floating swiftly with the current. In a few minutes the first bomb was exploded and this was followed at intervals of about 15 minutes by the explosion of the other three. As a result of these and other tests it is the belief of some observers that it is only a question of a short time when loaded shells and the magazines of battleships can be exploded from a distance by these rays.

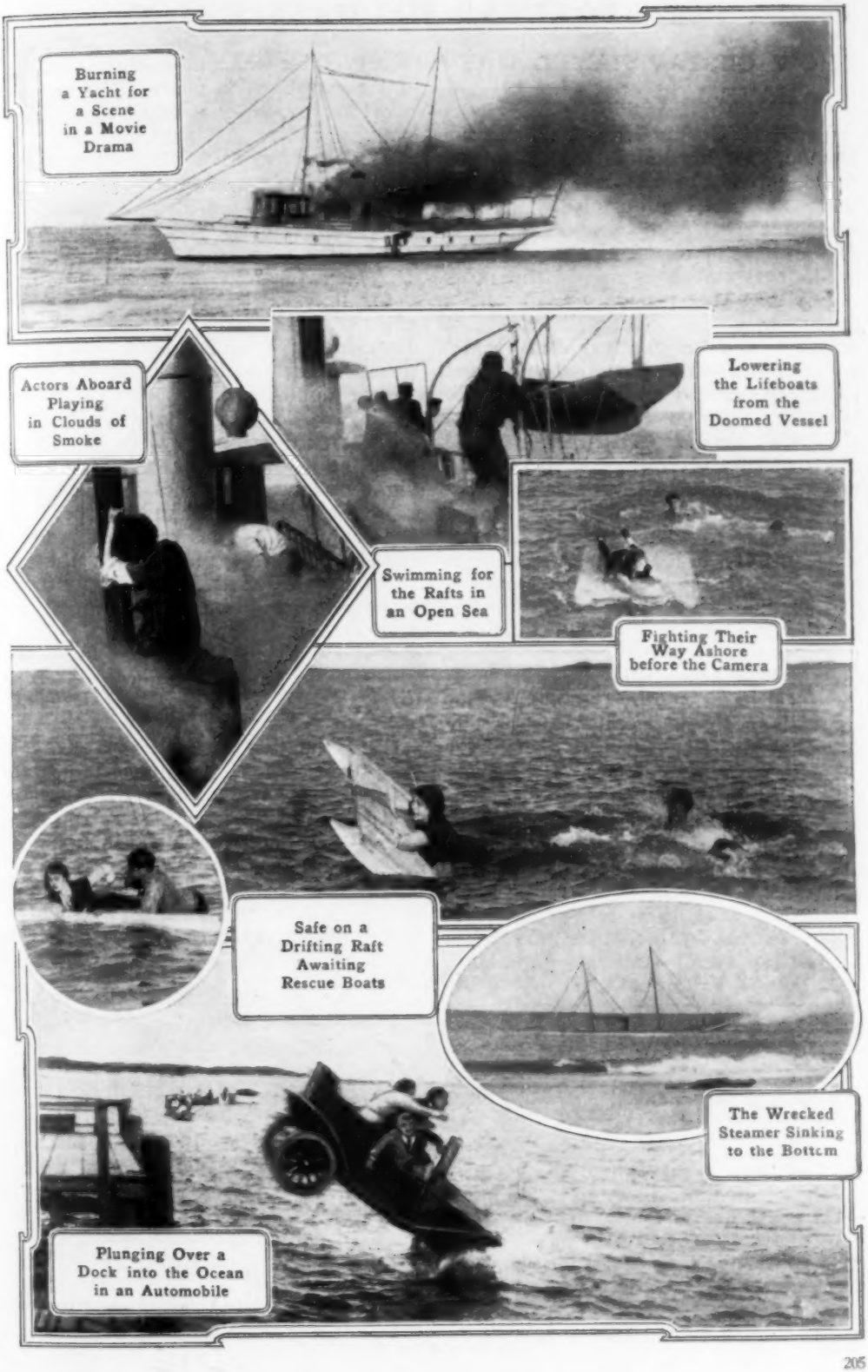
No one is allowed to examine the apparatus, and very little is known except by the inventor as to the exact means used in obtaining these remarkable results. The apparatus includes a wave projector and a generator of F-rays, with a wireless-telegraph apparatus having a mast and telephonic headgear. The wave projector is used for sending out rays, which are reflected back from the metallic object sought and indicate its direction and distance. F-rays of the proper intensity are then focused on the object and these rays, through some action not fully explained, ignite and explode the charge, and sometimes even fuse the metallic covering. The new rays are electric in their nature, and have some of the properties of Hertzian waves. The rate of vibration is stated to be lower than that of red light rays.

REAL STRUGGLES FOR LIFE BY MOVIE ACTORS

Plunging overboard from a burning yacht which had been soaked with turpentine and charged with dynamite, struggling on life rafts in a rough sea, racing an automobile over the edge of a dock—diving with it and taking a chance on getting out—such things put realism into the movies, give thousands their anticipated thrills and sometimes constitute the actor's last appearance. For often just as real as the actual destruction of a ship is the fight for life portrayed before the lens of the camera.

The staging of a photoplay which included the burning and sinking of a small craft and the battle of those aboard it to save themselves, recently was undertaken by a producer. Without flames, explosions and the loss of the vessel, the picture would lack realism. Unless men fought for their lives while the fire ate its way to the dynamite which would break the boat amidship, reality again would be sacrificed. When the picture was run on the screen it lacked none of these qualities. Large quantities of turpentine saturated the ship after it had been stripped of its interior fittings. Explosives were placed aboard. It then had to be fired, while those who did the work took a chance. As flames and smoke shot mast high, the men jumped into the sea, were picked up by boats, and carried a safe distance away before the terrific blast tore the craft apart and sent it to the bottom.

In another recent film drama two actors, one a girl, stayed with an automobile while it tore across a pier and leaped into the ocean. As the car struck the water they succeeded in jumping in time to escape being caught beneath the heavy weight and pinned to the bottom. The picture needed realism — the machine and actors supplied it.

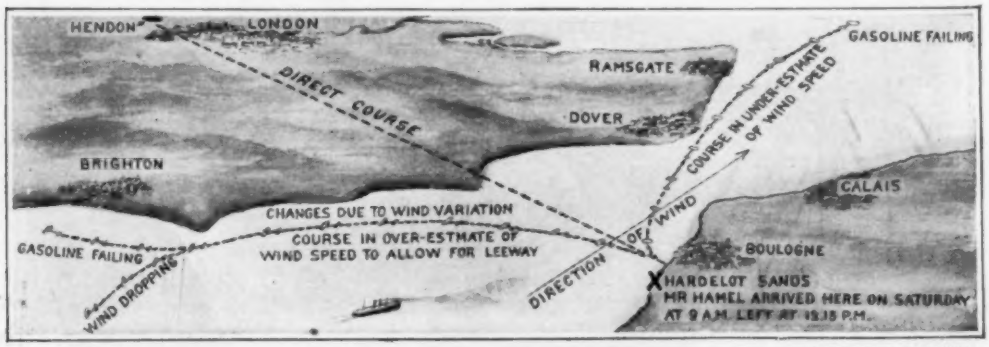

Burning a Yacht for a Scene in a Movie Drama
Actors Aboard Playing in Clouds of Smoke
Lowering the Lifeboats from the Doomed Vessel
Swimming for the Rafts in an Open Sea
Fighting Their Way Ashore before the Camera
Safe on a Drifting Raft Awaiting Rescue Boats
The Wrecked Steamer Sinking to the Bottom
Plunging Over a Dock into the Ocean in an Automobile

HOW GUSTAV HAMEL MAY HAVE LOST HIS LIFE

Just how Gustav Hamel, the British airman, lost his life in his attempted flight across the English Channel on May 23, 1914, will probably always remain a mystery. One explanation of the disaster to the airman has been made that not only seems the most logical one that can be offered, but is exceedingly interesting because it refers to the very danger that Hamel explained in his recently published book on aviation as being one of the most serious that can menace an experienced airman. At the time of the flight there was a strong wind blowing up the channel in a northeasterly direction, and in addition to this there was a heavy fog lying over the channel that entirely hid all landmarks from his view. Hamel carried a compass and by this means knew his directions, but he had no way of knowing the velocity of the wind and could not therefore make an accurate allowance for the drift caused by the wind. The channel opens out rapidly both north and south of the crossing, as will be seen from the map, and it is thought that either by overestimating or underestimating the force of the wind he drifted south or north so that he missed the land, which the fog hid from his view even if he came close to it, and that he was compelled to alight in the water when his two-hours' supply of gasoline gave out. His machine was a monoplane and was not equipped with floats. The airman wore an inflated pneumatic tire, which could not have sustained him long. In his book on aviation these statements that seem to apply so well to his own case appear: "In a machine traveling at upwards of sixty miles per hour a very few minutes out of touch with the map through mist or any other cause may be sufficient to confuse the pilot completely." "In the worst circumstances conceivable it might be possible, without knowing it, to travel in the opposite direction to that for which the head of the machine points. This would happen when traveling over the clouds or over the sea out of sight of land in face of a head wind of greater velocity than the speed of the machine. The compass would merely indicate approximately the direction of due north; it would not indicate anything about the progress of the machine."

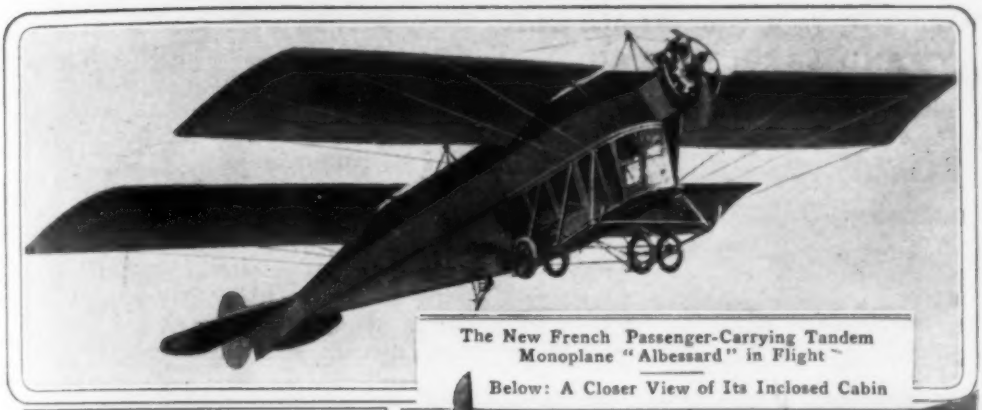
AEROPLANES THAT CARRY PASSENGERS

That the day of the big passenger aeroplane is close at hand is indicated by the feats performed by the Russian Sikorsky biplane as well as by the successful flights of a powerful monoplane recently built that has two pairs of wings placed fore and aft on the body of the machine. Each of these machines has a cabin or saloon inclosed by glass where the passengers may ride



COURTESY OF THE SPHERE

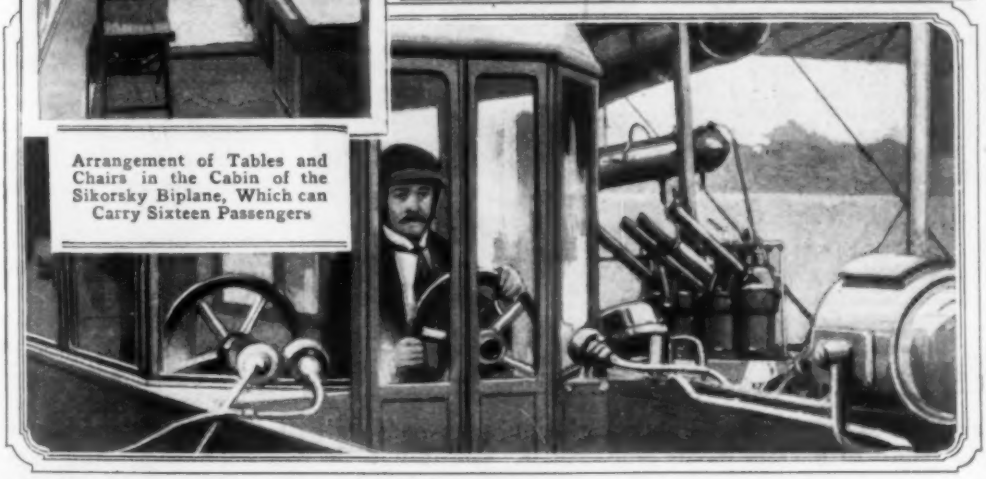
Map Showing How the British Airman, Gustav Hamel, may have Missed the English Coast, and been Compelled to Light in the Water, through Overestimating or Underestimating the Force of the Wind



The New French Passenger-Carrying Tandem Monoplane "Albessard" in Flight

Below: A Closer View of Its Inclosed Cabin

Arrangement of Tables and Chairs in the Cabin of the Sikorsky Biplane, Which can Carry Sixteen Passengers



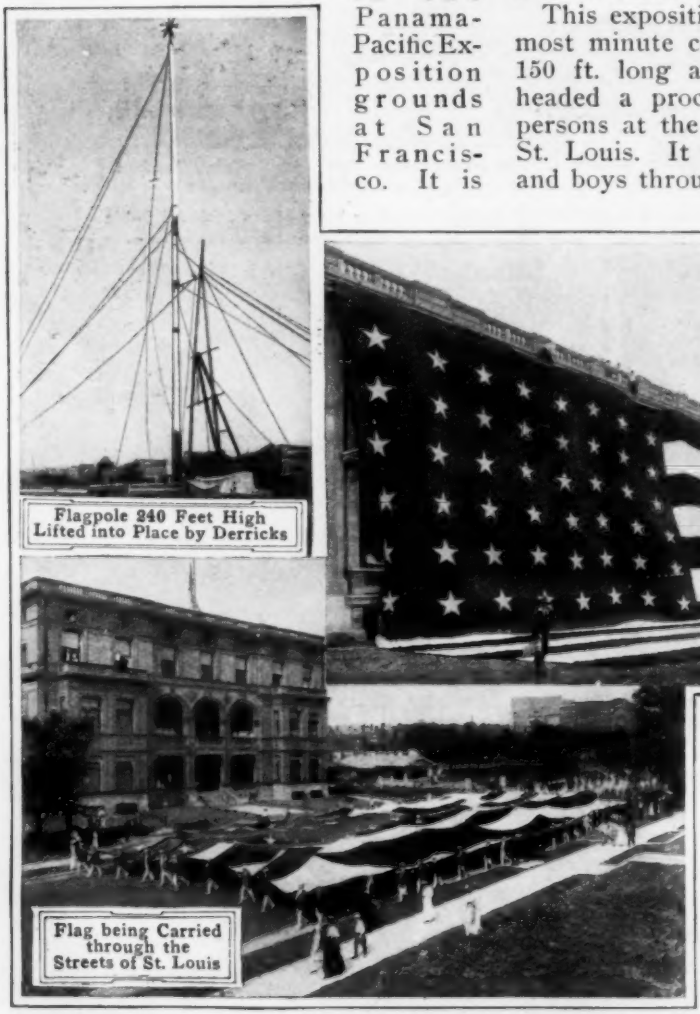
How the Pilot is Protected from the Weather in the Great Russian Biplane. Sikorsky, the Designer, is Shown at the Wheel

in ease and comfort. The Sikorsky machine, which has been described in recent issues of this magazine, has demonstrated its capacity by making a number of remarkable flights, in one of which sixteen passengers and the pilot were carried for 15 min., while with nine on board, it remained in the air 2 hr. 6 min The monoplane with tandem wings is known as the Albessard aerobus and has a tractor propeller driven by a 100-hp. motor.

TALLEST WOODEN FLAGPOLE AND LARGEST FLAG

The tallest single-piece wooden flagpole ever erected has been placed in the Panama-Pacific Exposition grounds at San Francisco. It is trimmed in the shape of a hexagon from the trunk of a Douglas-fir tree, 240 ft. in height, cut in Oregon. The pole is 4 ft. in diameter at the base, 15 in. at the top and weighs 35 tons. When erected it was imbedded in a reinforced-concrete foundation and anchored solidly. After the cement had set, all of the guy cables were removed, leaving the great shaft without a bracing other than its base. Three large derricks were used in lifting it into place. A spiked ball, weighing 620 lb. and measuring 10 ft. over all, was placed at the apex. When the exposition is opened the pole will fly a 46-ft. American flag.

This exposition flag, however, is almost minute compared with the flag, 150 ft. long and 75 ft. wide, which headed a procession of nearly 5,000 persons at the Flag Day exercises at St. Louis. It was borne by 250 men and boys through the principal streets of the city. In order to keep the flag from dragging as it was being carried, boy scouts took their places beneath the banner and supported its weight on props. At Jefferson Memorial the flag was hoisted, more than covering the east half of the north side of the building. It has been suggested that this flag be sent to San Francisco to be hoisted on the exposition flagstaff on "Missouri Day."



Flagpole 240 Feet High Lifted into Place by Derricks

Banner Covered Half of Jefferson Memorial

Flag being Carried through the Streets of St. Louis

¶Twenty minutes were required by an airman near Vienna to shave himself while flying around a race course. He steered his machine with his knees while performing the operation.

Soldier Firing Seated, with the New Heavy Marching-Order Pack Strapped to His Back, Showing Freedom of Arm Movement Now Allowed

THE tools of warfare which the soldiers, sailors and marines of the United States fighting force carry with them into action today are so different from those in use when the war with Spain was fought that to a veteran of that conflict almost the entire personal equipment of the modern fighting man seems strange and unfamiliar.

Efficiency, lightness and compactness are the ends that have been aimed at in the design and construction of modern weapons. In addition to the mechanical improvement of individual weapons, everything used by the three arms of the service has been standardized, so that all use the same rifles, ammunition, side arms, packs and miscellaneous equipment. The need of this was keenly felt at times during the last war. On some occasions sailors and marines would be almost overburdened with ammunition while the land forces were reduced to a few rounds of cartridges, and the one helpless to assist the other, all because of the difference in the types of rifles and ammunition used.

In pursuance of this policy of standardizing the general equipment, the most important step was the adoption of the new .30-caliber rifle, which now is used exclusively by soldiers, sailors, and marines. It is the smallest military rifle used by any great nation, and yet it is declared to be the most powerful. Its weight, including the bayonet, which weighs a pound, is 9.69 lb., and its length, 43.212 in. Elevated at an angle of 45°, this rifle will fire a bullet 4,891.6 yd. in 38.058 seconds. At a 100-yd. range, the bullet has penetrated 52.8 in. of seasoned 1-in. pine boards, spaced 1 in. apart. At ten times that distance, it has sent its projectile through 10.48 in. of boards similarly arranged, while boiler plate .528 in. thick has been bored at a distance of 50 ft. At 100 yd., bullets have dug through brick walls, 5.5 in. in thickness. The initial velocity of the bullet is 2,700 ft. a second, while the pressure in the chamber is estimated to be 51,000 lb. to the square inch.

The new gun is of bolt-action type, and operates by a bolt mechanism which includes the firing pin and springs, shell extractor and ejector,

Thirty-Caliber Rifle, Weighing 8.69 Pounds, and 43.212 Inches in Length, Used Exclusively by All United States Fighting Forces

Cartridge Fired by Rifle Shoots 150-Grain Projectile 4,891.6 Yards in 38.058 Seconds, Using About 50 Grains of Explosive

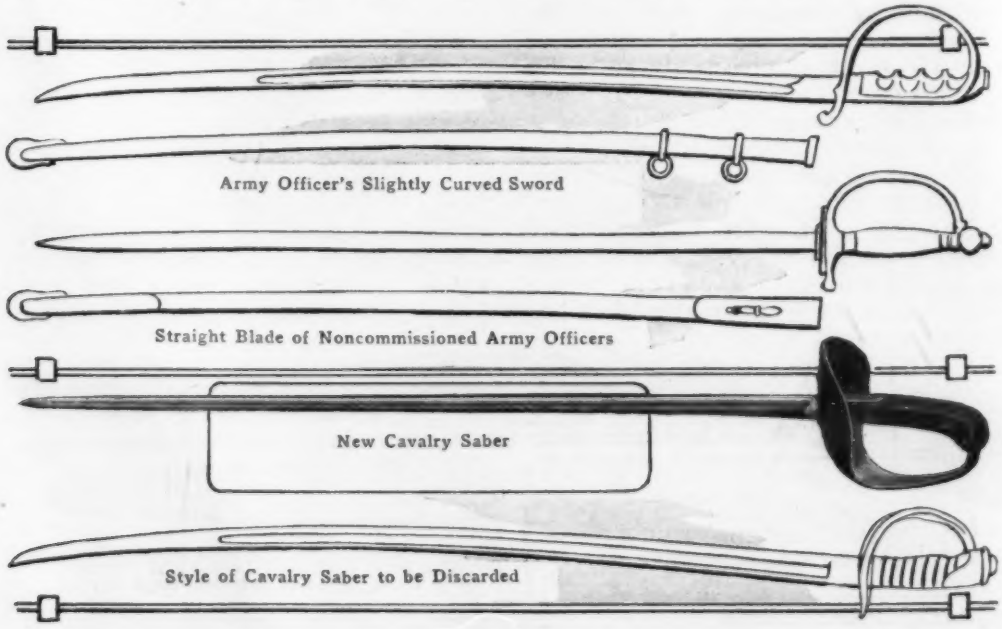
and safety lock. Beneath the receiver, in which the bolt slides, is arranged a magazine holding five cartridges. The uncovered metal surface is slight, for the stock extends within 3 in. of

Forty-Five Caliber Automatic Pistol Adopted for Military Use Because It Is More Effective Than the Ordinary Revolver

the muzzle, while a hand guard covers the upper side of the barrel, which is 23.79 in. long. In rapid firing, when the metal becomes heated, the hands of the operator in this manner are protected from the hot steel. Four-grooved rifling, each groove being .1767 in. wide, with one turn to each 10 in., is the interior character of the barrel. The weapon has been fired at a rate of 23 aimed shots a minute as a single-loader, and 25 shots using magazine fire. While shooting from the hip without aiming and using magazine fire, 40 shots have been fired in the same length of time.

The cartridge used is of the same type as that employed in certain automatic guns by the army and navy. Because of its tapered point the new bullet offers less air resistance than any model previously adopted by the government. Complete, the cartridge weighs 395.5 gr.; the projectile, 150 gr. This is composed of a lead-and-tin core inclosed within a copper-nickel jacket. The charge used in the shell is a composition similar to that used in large field and coast guns, and in amount approximates 50 gr. In the head of the brass, conical-shaped cartridge is a primer consisting of a cup, percussion composition, and a disk of shellacked paper for protection against moisture.

The .45-caliber automatic pistol has come into quite general use with all of the fighting forces. Until its adoption the .38-caliber revolver was almost exclusively employed, but is rapidly being supplanted because of the proved greater effectiveness of the automatic. This pistol is now a part of the equipment of every officer in all branches of the service, although its most conspicuous use is with the cavalry, field

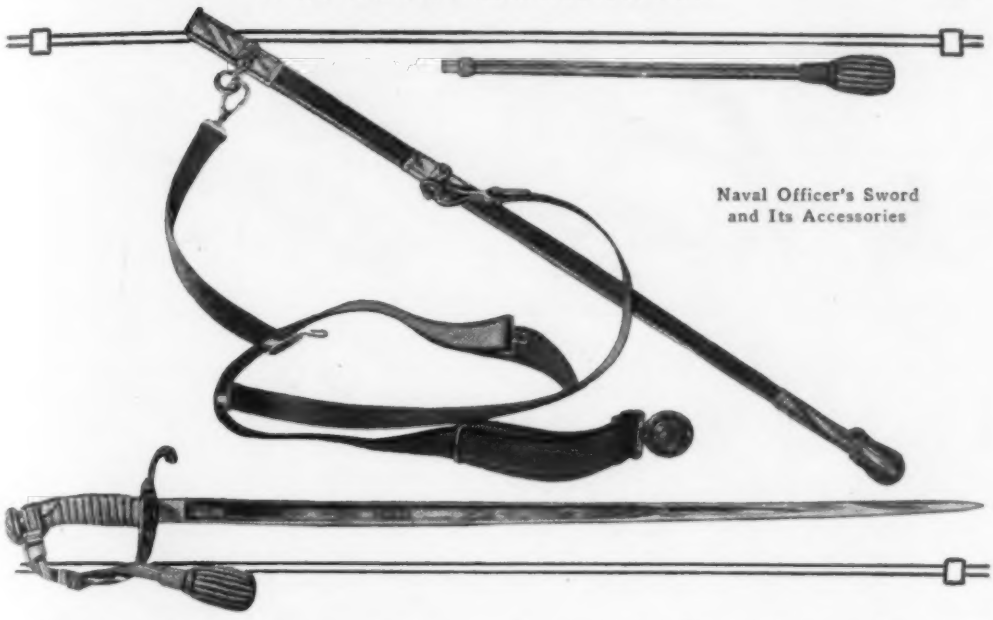


Army Officer's Slightly Curved Sword

Straight Blade of Noncommissioned Army Officers

New Cavalry Saber

Style of Cavalry Saber to be Discarded



Naval Officer's Sword and Its Accessories

artillery and signal corps, where one is allotted to each man. It also is provided for chief petty officers of the navy, and the first sergeant and two musicians of every company of infantry. Mechanism, operated by the action of gases generated in the barrel by powder explosion, opens the breech, cocks the hammer, extracts and ejects the empty shell, compresses the recoil spring, and reloads from the magazine. The projectile of the cartridge is similar to that used in the rifle, although much heavier, weighing 230 gr. The tremendous speed with which the pistol may be fired is shown by tests, in which it has been shot 21 times in 12 seconds. At 25 yd., the shell will penetrate 6 in. of hard-pine boards, and at 250 yd., 4 inches.

The sword has practically disappeared as an actual weapon, and while still retained by all officers, it merely acts as a badge of authority and is never carried during an engagement. The cavalryman is the only soldier who now makes use of the instrument in fighting, as the old-time cutlass of the sailor and the heavy saber of the artilleryman have been done away with entirely. One of the reasons that swords are no longer carried by officers during battles is that the glittering steel in the sunlight makes them targets for the sharpshooters of the enemy. Besides they are of no real service. The straight-blade sword, recently adopted for the use of the cavalry, is to be issued within a short time. As explained some time ago in this magazine, it is designed for thrusting, rather than cutting. The effectiveness of the two types has long been food for controversy in the cavalry, officers holding opposed views as to whether the thrust is more deadly than the cut. The style has been changed, however, and the new saber is at present in the course of manufacture. The weight of this sword, 43 oz., and the length of its blade, 36 in., are the same as those of the present arm, while its hilt is somewhat larger and is roughened to make possible a firm grip. It is fitted with a heavy solid-steel hand guard, resembling somewhat the old-time naval cutlass. A straight and often highly engraved blade, made with an ornamental guard and hilt, is the general characteristic of the naval officer's sword, which is worn only at drills and on dress occasions. The scabbard is of fine-quality leather, covered with brightly polished metal fittings. Officers in the various divisions of the army all carry the same general type

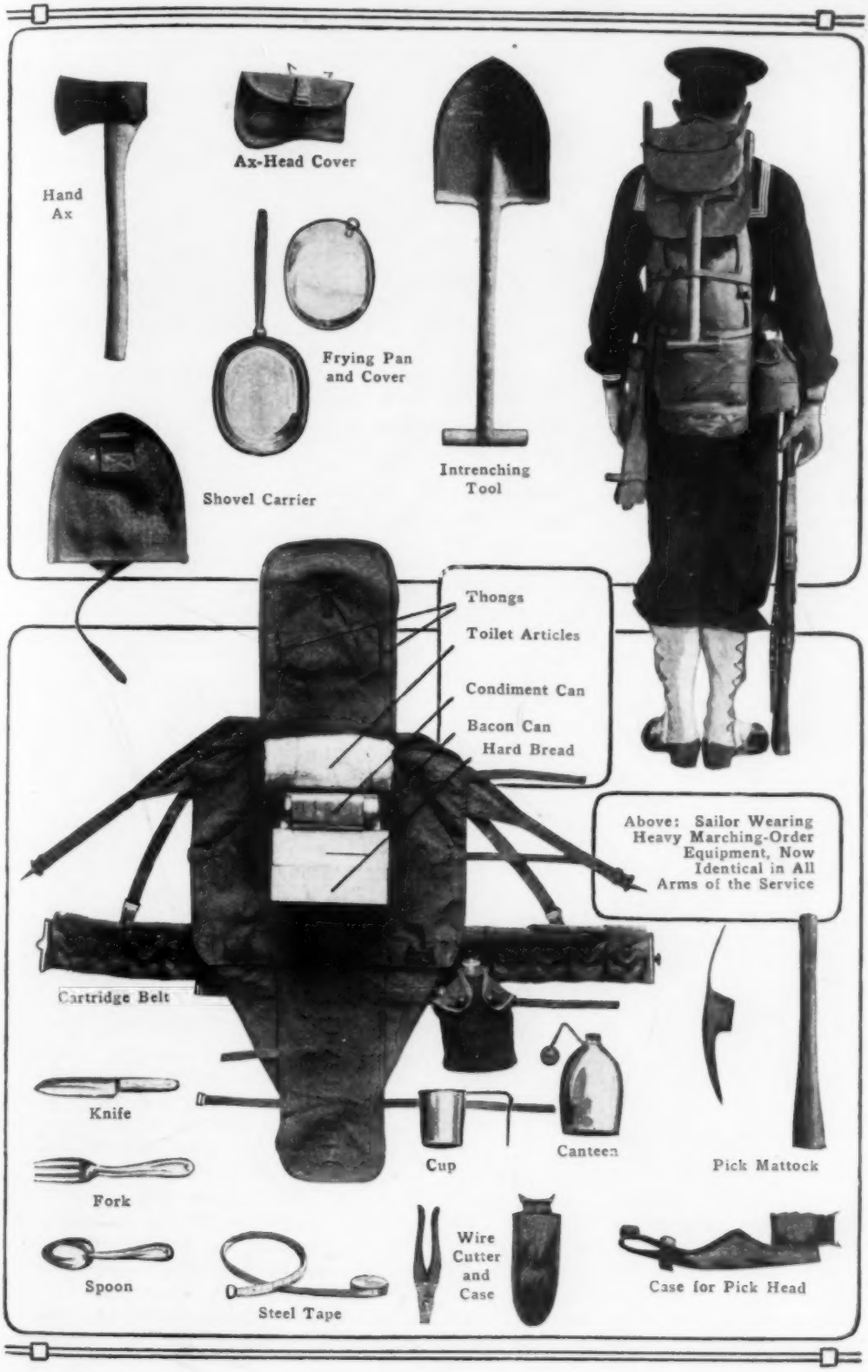
The Regulation Sword Bayonet Used with Army and Navy Rifles
Bolo, Patterned from Filipino Knife
Knife Employed by Hospital Corps

of sword, which is of the saber class, but with only a slightly curved blade, which varies from 30 to 34 in. in length. The guard is of German silver plated with nickel, while the hilt is made of black bone. The scabbard is metal, also nickeled. Straight-blade swords are the type provided noncommissioned regimental and battalion officers of the infantry.

Since shortly after the Russo-Japanese war the sword-shaped bayonet has been in exclusive use by all of the American fighting forces, with the single exception of the cavalry. Prior to that time, the rod type was in general use in this country, although the knife style had been commonly employed by foreign powers for years. The United States military authorities had been of the opinion that the bayonet had outworn its usefulness as an important factor in warfare. Records of the Russian conflict, however, largely disproved this contention and showed that the bayonet, on the contrary, had taken a quite conspicuous part in many of the most fiercely fought battles. This was the main reason for the abandonment of the former style. As adapted for the needs of the water and land forces of the United States, the sword bayonet is longer than that used by most of the foreign powers, this being made necessary because of the extreme shortness of the new rifle, which otherwise would entail a decided disadvantage to the American in a hand-to-hand encounter with a European soldier. The blade is 16 in. in length, and is provided with a tang, 4½ in. long, whereby it may be attached to the rifle barrel.

As every war is said to make a president, so might it be said that every war develops a new knife for military purposes. The bolo, which is allotted to mountain artillery, machine-gun troops, infantry and signal-corps companies, was copied from the similarly named knife of the Filipinos. It is especially designed for hewing purposes and the cutting of brush, having a heavy, thick 10-in. blade. This is flat on one side and beveled on the other, giving a hewing edge. It is 2 in. in width at the hilt, tapering to a sharp point, and is carried in a canvas-covered scabbard. Probably the oddest-appearing knife of all is one used by the personnel of the hospital corps. In weight and size it resembles the bolo, although the blade is approximately 3 in. longer and forged with curved lines, which give it a large rounded end. It is for brush-cutting and general utility.

On long marches, the old-style blanket roll which was swung over the left shoulder and fastened at the right hip, was cumbersome and the cause of almost universal complaint among military men. Freedom of action was hampered by it, while physical pain was often suffered by the rubbing of the bulky haversack strapped at the infantryman's left hip. Troublesome at its best, it worked hardship when the line was advancing through thickets or plunging over hilly and rough country. When sudden orders to fire caught the soldiers with the ungainly rolls strapped around them, arm action was impeded, making it difficult to properly operate a rifle. The heavy marching-order equipment of the pres-


Hand Ax
Ax-Head Cover
Frying Pan and Cover
Shovel Carrier
Intrenching Tool
Thongs
Toilet Articles
Condiment Can
Bacon Can
Hard Bread
Above: Sailor Wearing Heavy Marching-Order Equipment, Now Identical in All Arms of the Service
Cartridge Belt
Knife
Fork
Spoon
Steel Tape
Cup
Canteen
Wire Cutter and Case
Pick Mattock
Case for Pick Head

ent, which is the same in the army, navy, and marine corps, consists of a somewhat lighter load, which is manifestly compact and portable. Everything needed by the soldier is contained in the pack strapped to his back by means of suspenders worn over the shoulders, and fastened at the bottom to the cartridge belt, which equalizes the weight. Free arm and leg action is given, while the load is so placed that its weight is not thrown upon one part of the body, does not cause difficulties in marching through bad territory, nor interfere with the immediate execution of firing orders.

Attached to the haversack are the pack and intrenching-tool carriers, while the first-aid pouch, canteen, pick mattock or hand ax, are held by the cartridge belt. The three separate carriers in this manner are bound together into one compact bundle. Loops on the left side of the haversack provide a place for carrying the bayonet scabbard. All the coverings are made of waterproof olive-drab cotton duck. The pack consists of half of a "dog tent," which may also be used as a poncho, a blanket and the tent pins. In folding, it is so assembled as to make use of the half tent for a covering. The pack then is secured to the haversack by means of a carrier arrangement. The contents of the latter article consist of four cartons of hard bread, a condiment can, bacon can, meat can, toilet articles, towel and socks, a cover which is used as a plate, and a knife, fork, spoon and cup.

A pointed-blade shovel, weighing 30 oz., and fitted with a short, T-shaped handle, is the intrenching tool. The bottle-shaped canteen, which holds a quart, is made of seamless aluminum. The threaded neck secures the cup top, which is attached by a short length of chain. Forty-two ounces cover the weight of the pick mattock which has a solid cast-steel head, drop-forged and ground. The blade and point are tempered. The hickory handle is detached when the implement is being ported. The hand ax, which is of the short-handled woodsman type, weighs 28½ ounces.

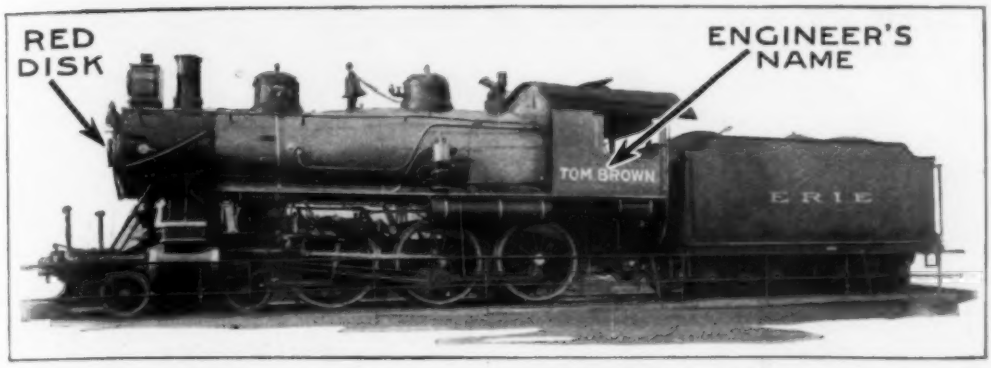
A wire cutter and a 5-ft. flexible-steel tape are carried in the equipment, the former being attached to the cartridge belt. No one man, however, is supposed to carry a pick mattock, hand ax and wire cutter, but these articles are distributed throughout the company so that each soldier carries only one of them.

Instead of acting as a hindrance in carrying out the order to "fire sitting," the newly devised pack, on the contrary, is an assistance. It forms a comfortable rest for the back, and allows a soldier to remain in a sitting posture on the ground for long durations without physical strain. This was not at all true of the blanket roll. In the photograph, at the beginning of this article, of an infantryman firing while seated, the latest-style campaign hat and the ribbon puttees, which have replaced the canvas leggings, are shown.

[The fighting machines which a landing party of sailors or marines takes ashore, the field and camp equipment of bodies of soldiers, and the rest of the tools with which the United States goes to war, will be illustrated and described in the September number of Popular Mechanics Magazine.]

RAILROAD'S RECOGNITION OF LOYALTY

To encourage loyalty among the employes and to inspire them to see and live up to their opportunities, the Erie Railroad has installed a system of prizes, honor rolls and other marks of recognition, and this system has apparently resulted in a revolutionary improvement in discipline and efficiency. One of the most pronounced marks of recognition is membership in the Order of the Red Spot, to which only locomotive engineers are eligible, and for which the requirements are general efficiency in the handling of the locomotive. An engineer who has made a record entitling him to membership is allowed to have a red spot painted on the front of his locomotive as a background for the disk carrying



Engineer's Name Painted on Locomotive Cab as a Reward for Good Record. The Red Spot, Another Mark of Recognition, is Painted on the Front of the Boiler as Indicated by Arrow

the engine number. As a further recognition of men having the longest record of competent service one engineer on each division is allowed to have his name painted in gold letters on the cab of his locomotive. The honor roll, designed for the benefit of all classes of employes, is a system of credit marks given for special acts of diligence and observation, as, for example, the discovery of a broken rail. These credits do not determine the advancement of the recipient, but have weight when any charges are made against him. Substantial rewards in money are given for efficiency in maintaining track. The railroad is divided into three grand divisions, and these are subdivided, each subdivision being in charge of a supervisor. At the end of each working season an inspection car goes over the entire system, taking a record of the physical condition of the track, and this, combined with the cost of maintenance, determines the award of the prizes. On each grand division prizes are awarded to the two supervisors making the best record, while smaller prizes are awarded to two section foremen on each of the subdivisions.

¶The recent earthquake in Sicily, which was accompanied by an eruption of Mount Etna, is thought by an Italian scientist to have been caused by an underground infiltration of sea water into the hot zone underlying the volcano.

WIRELESS STATION IN SULU ARCHIPELAGO

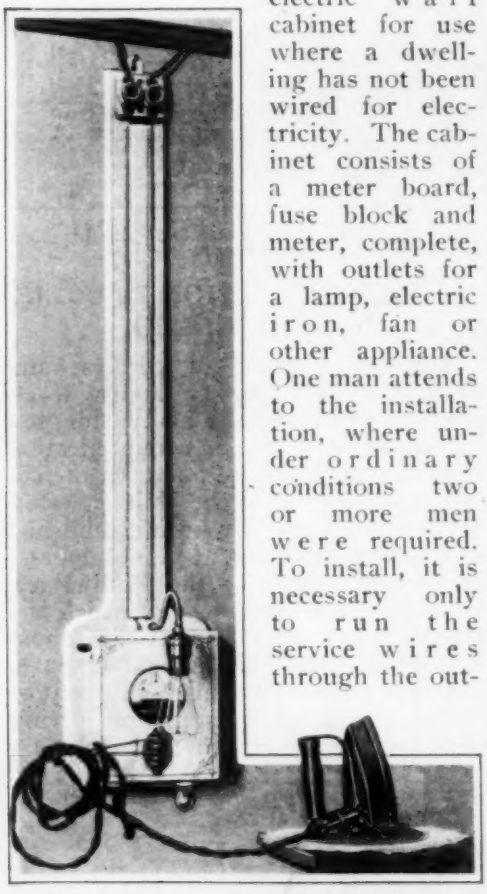
Through a chain of wireless stations that is being gradually developed, the government at Washington will soon be in direct communication with the most remote points in the colonial possessions of the United States. Stations have already been established at Panama, at Guam, at Honolulu, and at various points in the Philippines. Even the Sulu Archipelago, which has always been regarded as the most savage of the Philippine possessions, has been invaded by this instrument of civilization, a wireless station having recently been established at Jolo, on

Government Wireless Station Recently Established at Jolo, in the Sulu Archipelago

one of the largest islands of the archipelago. This station, with its slender latticed tower, is in marked contrast with its primitive surroundings.

ELECTRIC WALL CABINET SAVES WIRING COST

A New Orleans electric-light company is offering to its customers an electric wall cabinet for use where a dwelling has not been wired for electricity. The cabinet consists of a meter board, fuse block and meter, complete, with outlets for a lamp, electric iron, fan or other appliance. One man attends to the installation, where under ordinary conditions two or more men were required. To install, it is necessary only to run the service wires through the outside walls in insulated tubes, and hang the cabinet in place. The current is available by simply plugging in the appliance desired.



Handy Contrivance Adapted to the Needs of Small Users of Electricity

A FAMOUS LINER TO BE BROKEN UP

Outgrown, not worn out, the famous White Star liner "Majestic," once the pride of the Atlantic passenger fleet, has been sold, and will be broken up for the metal that it contains. The purchase price was $125,000. The "Majestic" was a sister ship to the "Teutonic," and was built in 1889. At that time these splendid boats were considered the last word in naval architecture, but the trend of modern shipbuilding is toward greater capacity, the newer boats being almost twice as large. The "Majestic" was but 568 ft. in length and its beam was but 57½ ft. Its best speed was a trifle over 20 knots.

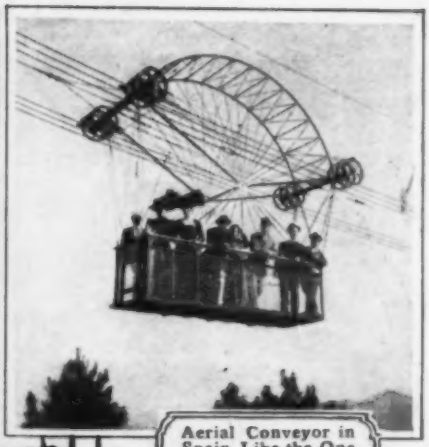
CABLEWAY TO SPAN NIAGARA WHIRLPOOL

An aerial passenger cableway is soon to be built across the whirlpool at Niagara Falls to enable visitors to get a close view of that marvel of nature and to experience the thrills connected with such a view without incurring any danger. The system is similar to one recently installed at San Sebastian, Spain, for spanning a chasm between two mountain resorts, and to the one that climbs the first stage of the Wetterhorn in Switzerland. The whirlpool is situated in Canadian territory about six miles below Niagara Falls. The cableway is to be about 1,770 ft. long, with the cables stretched at an elevation of about 250 ft. above the whirlpool. The car, which has already been built in Spain, has a capacity of 50 passengers. This car is to be hauled back and forth across the chasm, traveling on six 1¼-in. steel cables placed three on each side of the car, and propelled by a haulage cable. Each cable is attached to a fixed anchorage at one end of the line, and to a counterweight system at the other. In this way the tension on the cables will not be increased by the weight of the car, although the deflection of the cables will be increased. The framework that supports the car is of a curious type, as will be seen from the illustration. At each end of the car are six wheels that run on the cables. Spanning the space between these are metal tubes, the upper of which are curved, and from which the car is suspended by wires that are always in tension. The estimated cost of the installation is $120,000.

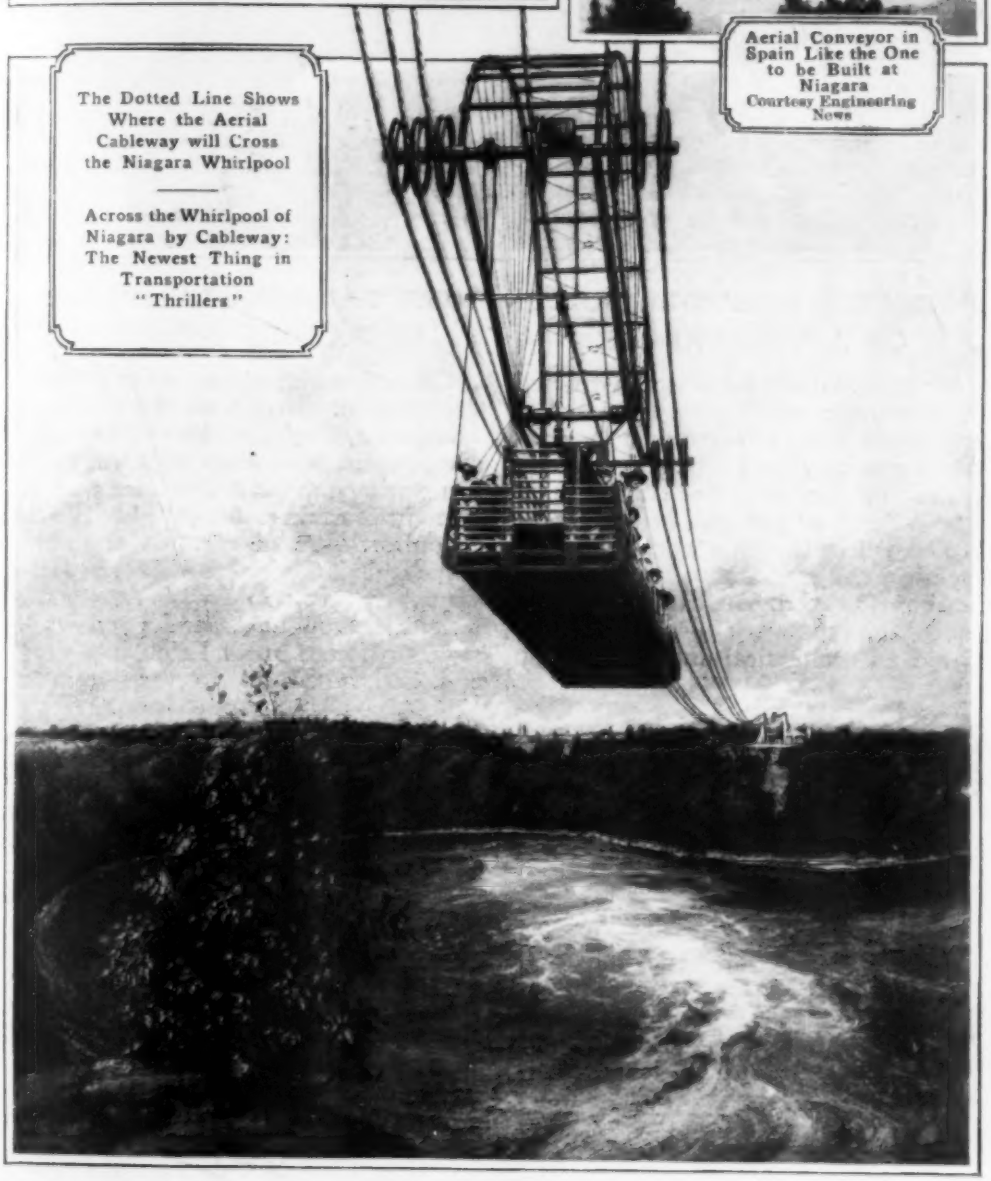
The Dotted Line Shows Where the Aerial Cableway will Cross the Niagara Whirlpool

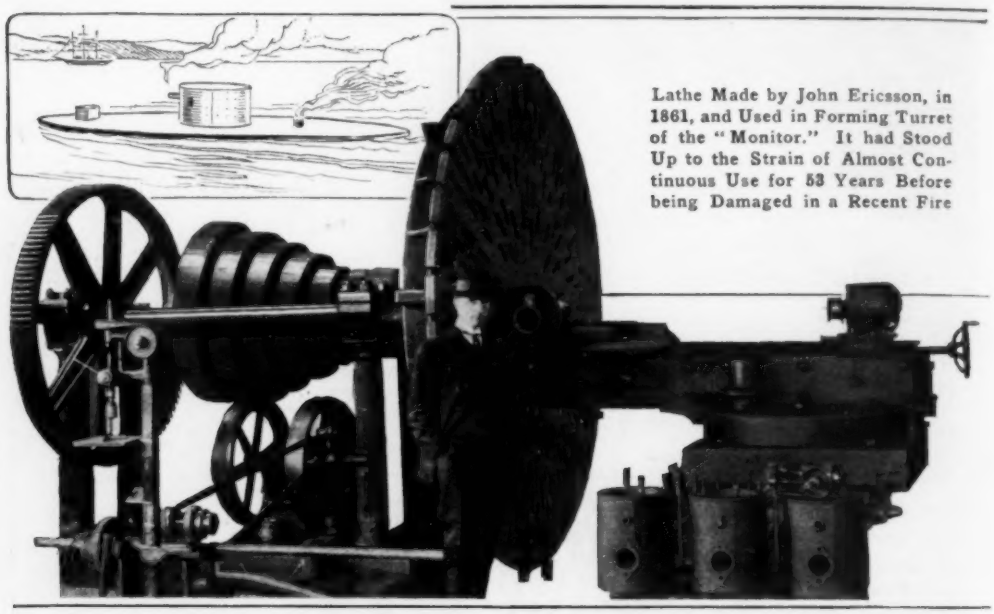
---

Across the Whirlpool of Niagara by Cableway: The Newest Thing in Transportation "Thrillers"



Aerial Conveyor in Spain Like the One to be Built at Niagara
Courtesy Engineering News

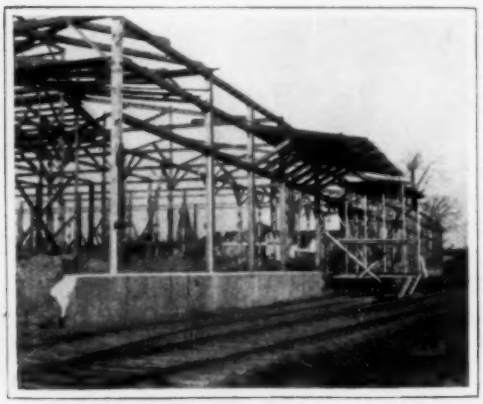




Lathe Made by John Ericsson, in 1861, and Used in Forming Turret of the "Monitor." It had Stood Up to the Strain of Almost Continuous Use for 53 Years Before being Damaged in a Recent Fire

PORTABLE SCAFFOLD BUILT ON A LOGGING CAR

A novel scaffolding was constructed for erecting a mill frame, by which a large saving was effected over an ordinary temporary scaffolding. A railroad track ran by the site selected, and upon an old logging car the scaffold was erected where the men worked in constructing the mill frame and building the roof overhead. The car was pushed along as the work proceeded and proved an economical and satisfactory affair.



Logging Car Used as Base for Scaffolding

FIRE DAMAGES LATHE USED IN MAKING "MONITOR"

One of the machines damaged in a fire that destroyed an ironworks at Houghton, Mich., on May 6, 1914, was the historic lathe made by John Ericsson during the Civil War and used by him in forming the turret of the "Monitor." Aside from its historic value, this lathe is remarkable in many ways. It was made with the characteristic thoroughness and good workmanship found in all Ericsson's work, and had stood up to the strain of almost continuous use for 53 years. This is all the more remarkable because of the fact that it was made in a hurry. One hundred days after the contract for the "Monitor" was awarded, the vessel, with turret and all completed, was ready for duty. The lathe had been made during this period and in time to do the work on the turret. Originally the lathe had a faceplate 14 ft. in diameter, and was so mounted that it was capable of turning a surface of 35-ft. diameter, but the faceplate was afterward cut down to 12 ft., so that it could be handled in shipment. The original cost was $10,000. Several years ago a Swedish-

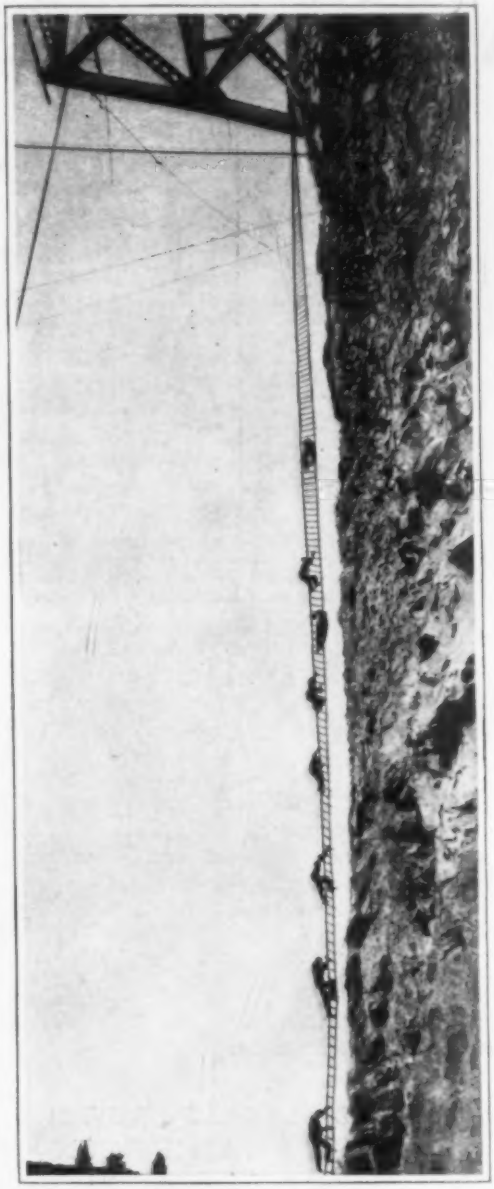
American association that desired to secure the lathe as a historic relic, offered the owners $13,000 for it, but the offer was refused on the ground that the lathe could not be reproduced at the present time for that amount.

CRUISER STERNS FOR MERCHANT VESSELS

The beautiful overhanging stern of the modern liner is being replaced by the so-called "cruiser stern," which is claimed to possess decided advantages as regards propulsion, protection to rudders and propellers from dock walls and wharves, as well as from barges and lighters. With the passing of wooden vessels and the general adoption of steel in the construction of the hulls, certain restrictions imposed by the nature of the material, especially when that material was wood, are found to be negligible. Steel plates can be bent, steel knees constructed to give greater strength and greater carrying capacity toward the stern of the ship than it was possible to secure with wood. The naval type, from which the cruiser stern takes its name, has long recognized that the long water line is favorable to speed, and the full length of the vessel is used to facilitate propulsion. It is utility against appearance, and utility, which means greater carrying capacity, greater speed and less coal burned per ton of cargo carried, has the upper hand.

MEN CLIMB LADDER THREE HUNDRED FEET TO WORK

Employes engaged in the construction of a single-span arch bridge of the Oregon Trunk Line, over the Crooked River, climbed a rope ladder 300 ft. up the side of a solid wall of rock daily in going to their work. Camp was established in the canyon on account of the water supply. An incline railway was out of the question, so it was necessary to swing a hemp ladder from the top of the cliff. When the wind rushed through the rift the frail stairway would be blown about like a string. This made the climb especially spectacular, if not actually precarious.



Bridge Builders Climbing Rope Ladder to Work

Often the ladder was spotted from top to bottom with its human "flies." The bridge consists of one span, 340 ft. in length, while the rails are 320 ft. above the floor of the canyon.

WATERPROOF ROBES FOR MOTORISTS

A waterproof robe or rug for the protection of the man or woman who is forced to drive an automobile through

Protective Coverings for Automobile Drivers and Horseback Riders Who Must Face Rainstorms

a driving rainstorm has been invented by an Englishman. The outside is a flexible waterproofed cloth, which is continued up as a lining at the bottom for a foot or more. A soft, warm cloth is used for lining the rest, and the robe is equipped with hooks and straps at the upper edge, so that it keeps its place even when the driver is walking about, the lining at the lower edge permitting easy cleaning if it becomes soiled from the mud.

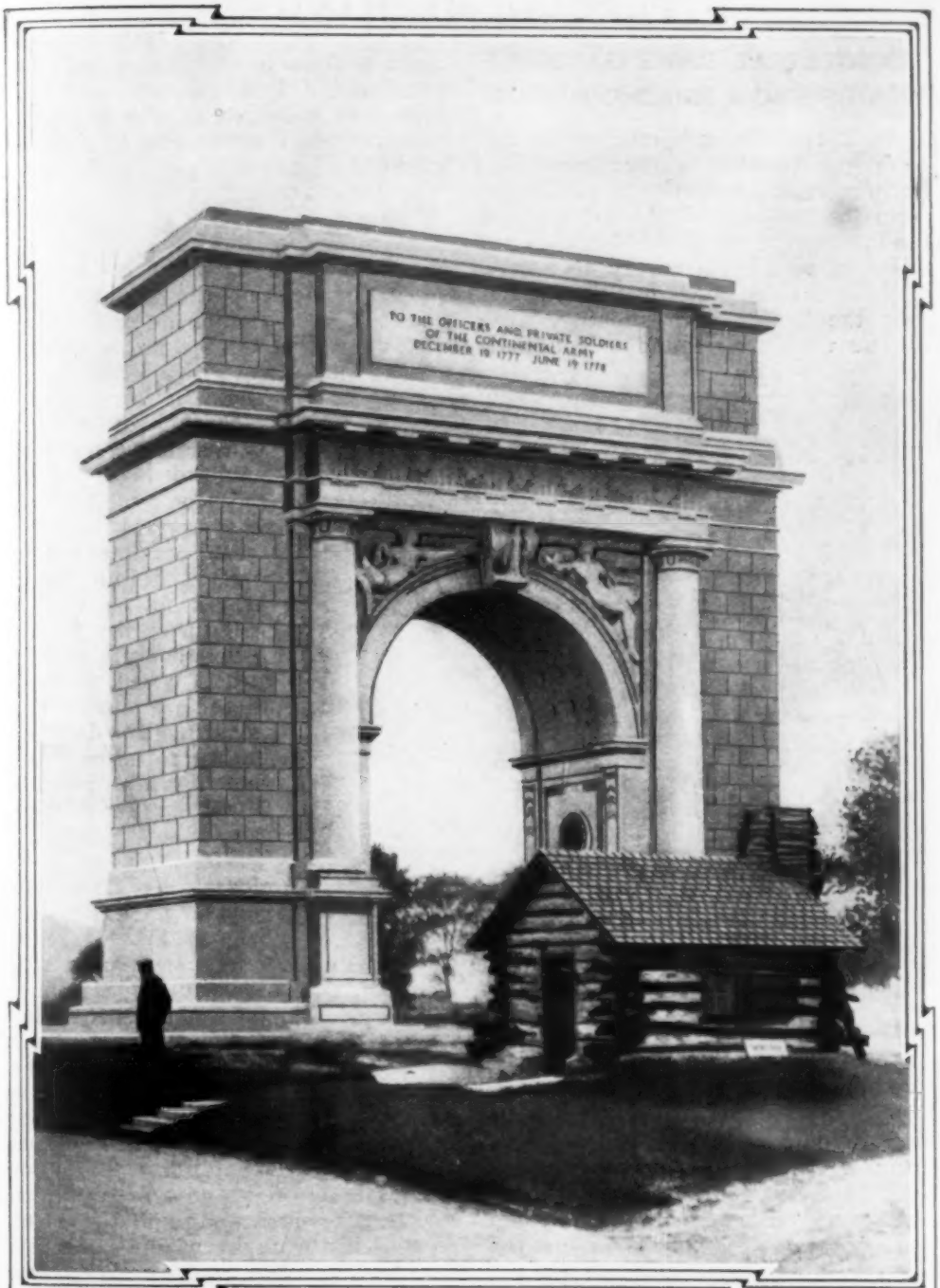
A similar idea is carried out in the waterproof lap robe for horseback riders, attached to an overcoat, which is also illustrated here.

WIRELESS SIGNALS BETWEEN PARIS AND WASHINGTON

The exchange of wireless time signals betwen the Eiffel Tower in Paris and the wireless station at Arlington, an account of which was given in the March, 1914, number of this magazine, has proved so successful that wireless impulses sent out by the beat of the clock at Paris have been picked up by the station at Arlington and compared with the observatory clock at Washington for a period of as much as three minutes. Before the early part of May considerable difficulty was experienced in carrying out these experiments, partly owing to the interference of other wireless stations, but chiefly because of discharges of atmospheric electricity. The operators are making the most of the present favorable season for wireless operation and are pushing the work in an attempt to get definite results. One of the chief purposes of these experiments is to determine accurately the difference in time, and therefore in longitude, between Paris and Washington, but investigations for advancing the science of wireless will also form an important part in the work. It has been ascertained that wireless signals travel through space at approximately the velocity of light, 186,000 miles a second, but that there is a small loss of time amounting to a fraction of a second as the message leaves the transmitter and enters the receiver. Careful measurements are being made to determine what this loss amounts to at each end of the line.

TRIUMPHAL ARCH AT VALLEY FORGE DEDICATED

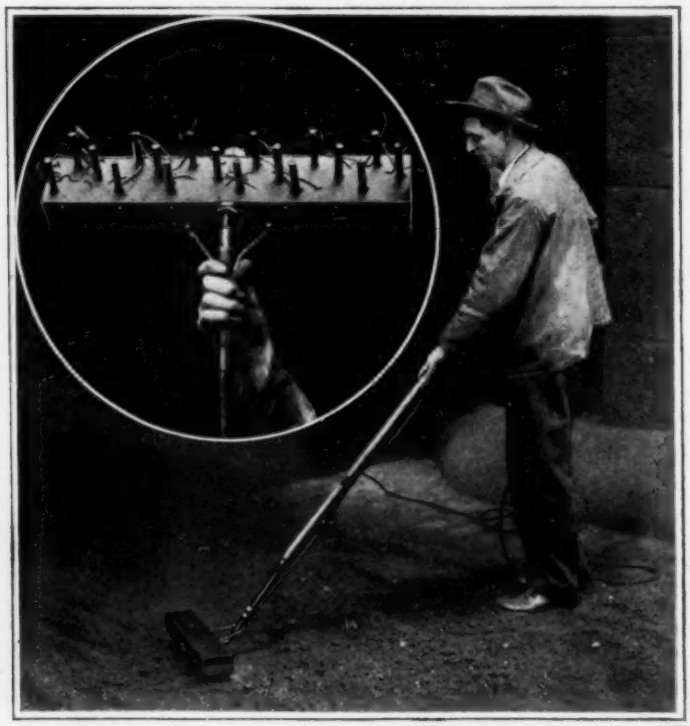
The arch of triumph for which Congress appropriated $100,000 in 1910 has been built and dedicated to the American soldiers who endured such terrible privations while in winter quarters at Valley Forge in 1777-78. In 1893 the state of Pennsylvania bought 475 acres of land covering the site of the camp and formed it into "Valley Forge Park." The new monument, which occupies a prominent place in this park, is in the style of a Roman arch and is a massive granite structure, 60 ft. high, with inscriptions commemorating the sufferings of the soldiers. Near the arch, and forming a sharp contrast with it, is a log cabin typical of the quarters in which the Continental army under General Washington spent that memorable winter.



Arch of Triumph at Valley Forge, Pa., Dedicated to the American Continental Army Whose Sufferings during the Winter of 1777-78 Made That Place Historic. The Log Cabin is Typical of the Quarters in Which the Soldiers Spent the Winter

ELECTRICAL RAKE GATHERS NAILS FROM ROAD CINDERS

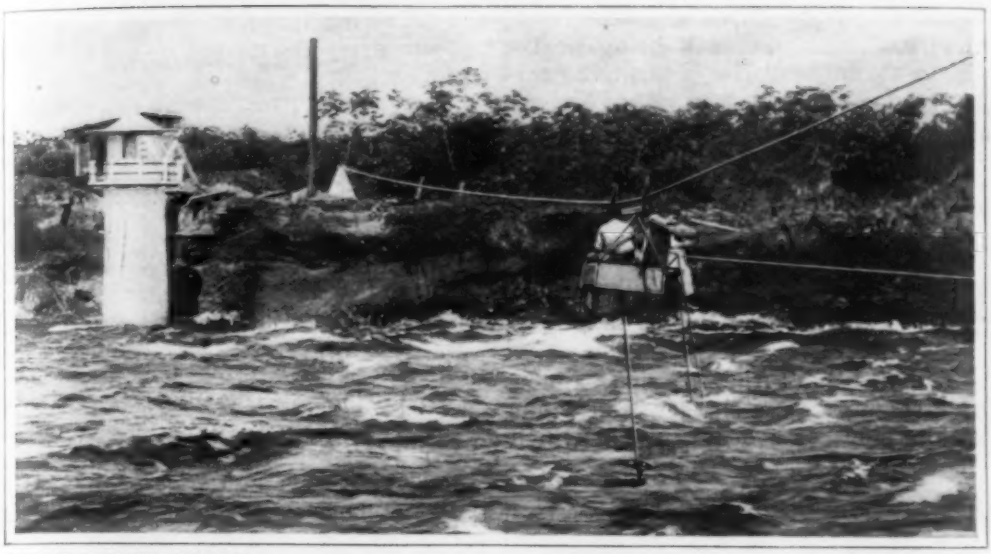
An electromagnetic rake which collects iron objects has been found to be of service in freeing road cinders from foreign matter. In the teaming tunnel beneath the Federal building at Chicago, it was necessary to spread cinders on the inclines in order to prevent the horses from slipping. The cinders used were found to contain a large number of nails and other objects. So many of the horses were injured by running nails into their hoofs, that every effort, including sifting, was employed to safeguard against the danger. This failed, however, and the trouble continued until one of the electricians constructed a heavy rake, the staggered-set prongs of which were horseshoe-shaped magnets. The coils were joined in series, while connecting wires extended along the handle and then through a heavy insulation to light sockets in the side walls. Approximately 5 lb. of nails and short wire was collected in a few minutes from a small portion of the underground driveway.



This Electromagnetic Rake Clears a Cinder Roadway of Loose Nails and Pieces of Wire

OBSERVATIONS INDICATE LIFE ON THE MOON

That some kind of vegetation and, possibly, even animal life of a low order, may exist on the moon, is indicated by observations made by Prof. W. H. Pickering of Harvard University and announced in a bulletin recently issued by the astronomical department of that institution. If this theory proves to be true, it will upset the present belief that the moon is a dead world, although there are no indications that life in forms known to us exists on the earth's satellite. For a number of years the most prominent "craters," or areas inclosed by mountain rims on the moon, have been studied by astronomers working with powerful telescopes, and changes in coloring have been observed that can only be accounted for on the supposition that they are caused by the periodical growth and decline of vegetation. The moon rotates once on its axis each time it makes a revolution around the earth, so that it always keeps the same side turned toward the earth. For the same reason a day on the moon is equivalent to one lunar month as we know it. Although periods of activity extending over several months have been observed, the changes in coloring that indicate the growth and decline of vegetation usually undergo a complete



COPYRIGHT, UNDERWOOD & UNDERWOOD

How the Engineers Measure Depth of Water and Velocity of Current Close to the Spillway of Gatun Lake, Where the Current Is Too Swift for a Boat to be Used

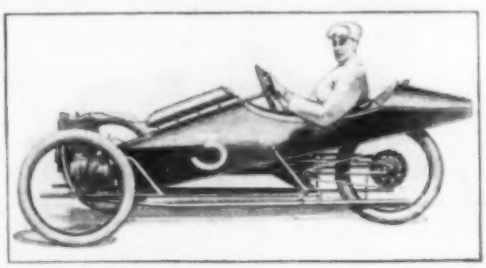
cycle during the 14 terrestrial days that intervene between the lunar sunrise and sunset, and it is apparent that day and night on the moon are in a way equivalent to our summer and winter. If the moon has an atmosphere it is so thin that no evidence of it has ever been discovered by scientists, but there is little doubt as to the existence of ice and snow, and it is thought that there may be limited quantities of oxygen, carbonic-acid gas and vapor of water. Any vegetation that exists on the moon must be able to extract all its sustenance, including these gases, from the soil, while animal life could only exist in case it could extract oxygen from the vegetation during the lunar day and store it in sufficient quantities to last through the following night.

MEASURING THE WATER AT GATUN SPILLWAY

For sounding the depth of Gatun Lake and measuring the rate of the flow close to the spillway where the current is too swift and the water too rough for a boat to be used, the engineers improvised an aerial cableway and by this means were able to get out over the water and make the measurements safely and accurately. The car was an open tublike affair, made large enough to carry two men, and suspended by brackets and trolley wheels from a steel cable stretched across the narrow neck of water. From this car the sounding lead and other measuring instruments were lowered into the water at regular intervals, the car being pulled along by hand.

STREAMLINE CYCLECAR WINS ENGLISH RACE

The winner of the recent cyclecar race at Brooklands, the most famous of English racing courses, was an odd-shaped three-wheeled affair having a peculiar streamline body with a single



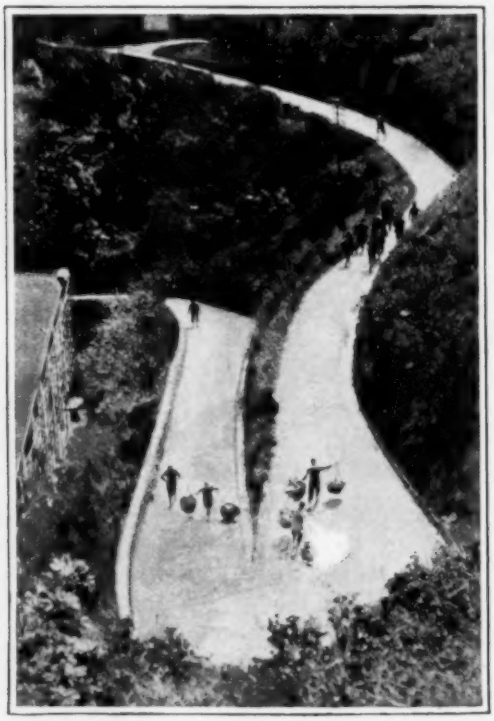
COURTESY OF THE CAR

Odd-Looking Cyclecar Which Won Race at Brooklands

seat. The body sloped sharply toward the front, the gas tank being at the highest point, assuring a positive gravity feed. The arrangement of the engine and steering apparatus differed little from accepted standards, but the single driving wheel made a differential gear and its consequent lost power unnecessary.

HONGKONG ROAD COMPOSED OF HAIRPIN TURNS

Twisting and turning at sharp angles on a steep grade, a slender road winds up the sides of a beautiful hill which



A Hairpin Curve on a Chinese Road

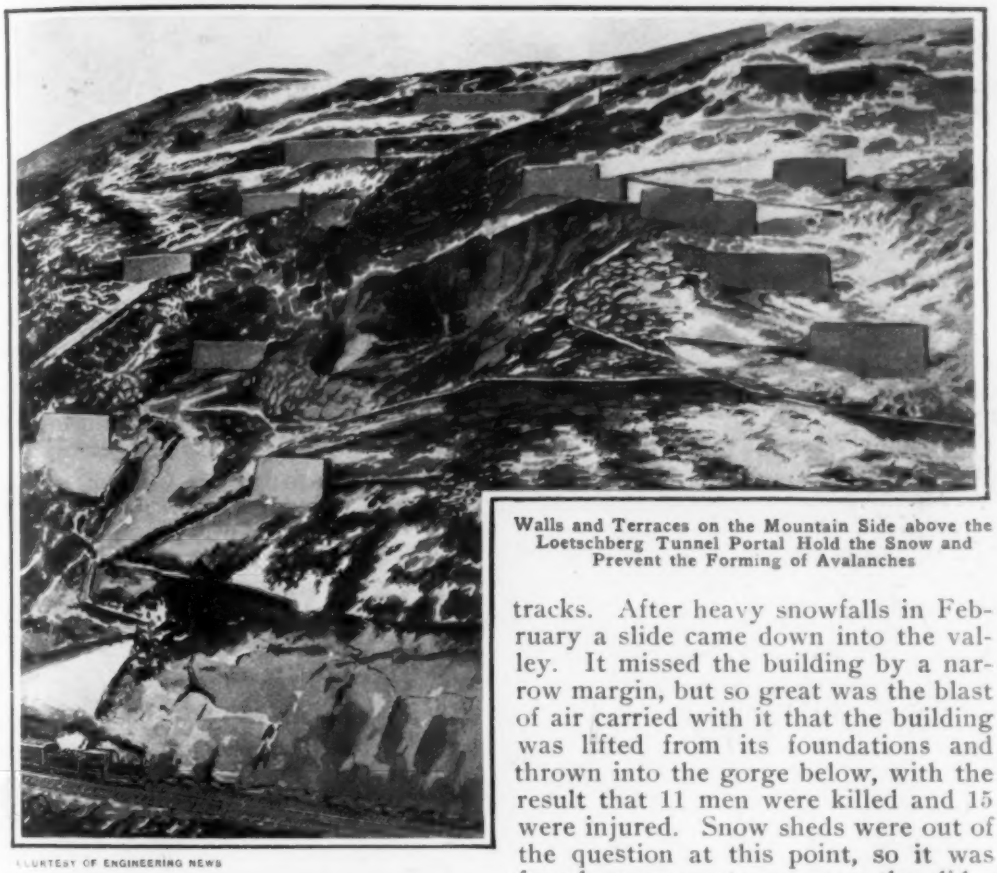
rises above Hongkong. The summit of the peak is the residence suburb for the wealthy citizens of the city during the hot months. The highway, because of its dangerous hairpin curves and terrific grades, is barred to motorists. An incline railway and the rather unsatisfactory path form the only means of reaching the top.

"MESSENGERS" WHO LIVE IN ENGINE CABS

Long before the engine driver takes charge of a new locomotive and starts it on its first run another man occupies the cab and makes it his home, often for weeks at a time. This man is the "messenger" sent out by the manufacturer to look after the locomotive and see that it is delivered in good condition to the purchasing railroad at the point specified in the contract. After a locomotive is finished it is first given a trial run by the maker, and if this proves satisfactory the machine is "stripped," which means simply that the driving rods and some of the other moving parts are removed and stored in the tender, and the engine is then ready for shipment. Often it has to be hauled for hundreds of miles over other roads before it reaches the purchasing road, and on this, its first trip, it goes as freight in a slow freight train, on its own wheels but not under its own power. With the bearings all new, there is constant danger that they will "run hot" and it is the principal duty of the messenger to watch out for this danger and prevent it, but there are many other troubles that may develop and the messenger must be on watch every minute his charge is moving. The cab is boarded up, provided with a door, and equipped with a small cook stove, table, and bunk. Here the messenger cooks and eats his meals, and sleeps when he has a chance. Provisions are carried in the tender. It takes a new locomotive about 18 days to get from Philadelphia to Kansas City and 45 days to get to California, much of this time being taken up by delays at division points where the locomotive must be taken from one train and placed in another. One messenger usually looks after two locomotives when more than one are shipped in the same train.

¶In Holland ancient houses have a special door which is used only when there is a marriage or death in the family.

AVALANCHES SUPPRESSED AT THEIR SOURCE



Walls and Terraces on the Mountain Side above the Loetschberg Tunnel Portal Hold the Snow and Prevent the Forming of Avalanches

COURTESY OF ENGINEERING NEWS

During the spring and summer avalanches are a constant menace to the railway line leading to the south portal of the Loetschberg tunnel in the Bernese Alps, Switzerland, and a great amount of protection work has been built in an effort to make this part of the line safe. One particularly dangerous point is a trough of the valley near the south portal of the tunnel, where at least six avalanche tracks, each having a name and being permanent in character, come to a focus. Some idea of the terrific violence of the slides that formerly came roaring down into this valley was given by a disaster that occurred in 1908 while the tunnel was under construction. A restaurant for employes had been built at the side of one of the avalanche tracks. After heavy snowfalls in February a slide came down into the valley. It missed the building by a narrow margin, but so great was the blast of air carried with it that the building was lifted from its foundations and thrown into the gorge below, with the result that 11 men were killed and 15 were injured. Snow sheds were out of the question at this point, so it was found necessary to suppress the slides at their sources. To accomplish this a system of snow-retaining walls and terraces, covering about 60 acres of the upper slope of the mountain, were built. These serve to hold the snow until it melts and flows away harmlessly. The minimum slide-starting slope is about 25°, and the area covered by the protection work contains slopes varying from this up to about 50°, as well as a great many precipitous cliffs. All this work is above the timber line. Below the timber line reforestation was resorted to as a means of holding the snow.

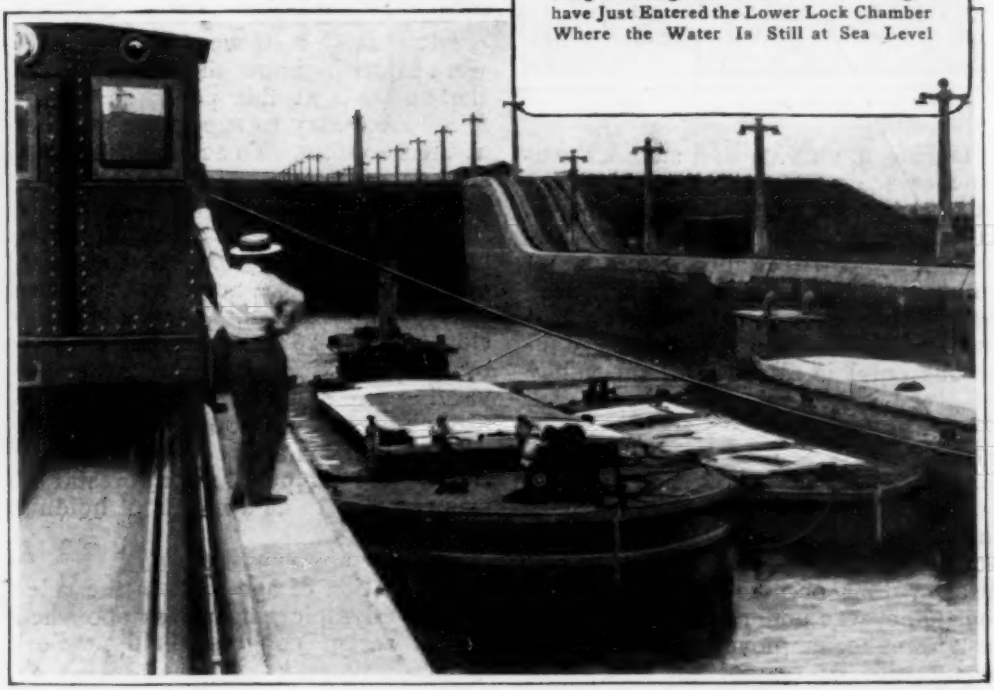
¶All mention of age limit in the rules for the Olympic games was abolished at the recent congress held at Sorbonne, Paris.

PANAMA CANAL READY FOR ACTUAL SERVICE

Steamship "Allianca" and Seagoing Dredge Test Working of Locks and Electric Towing Locomotives

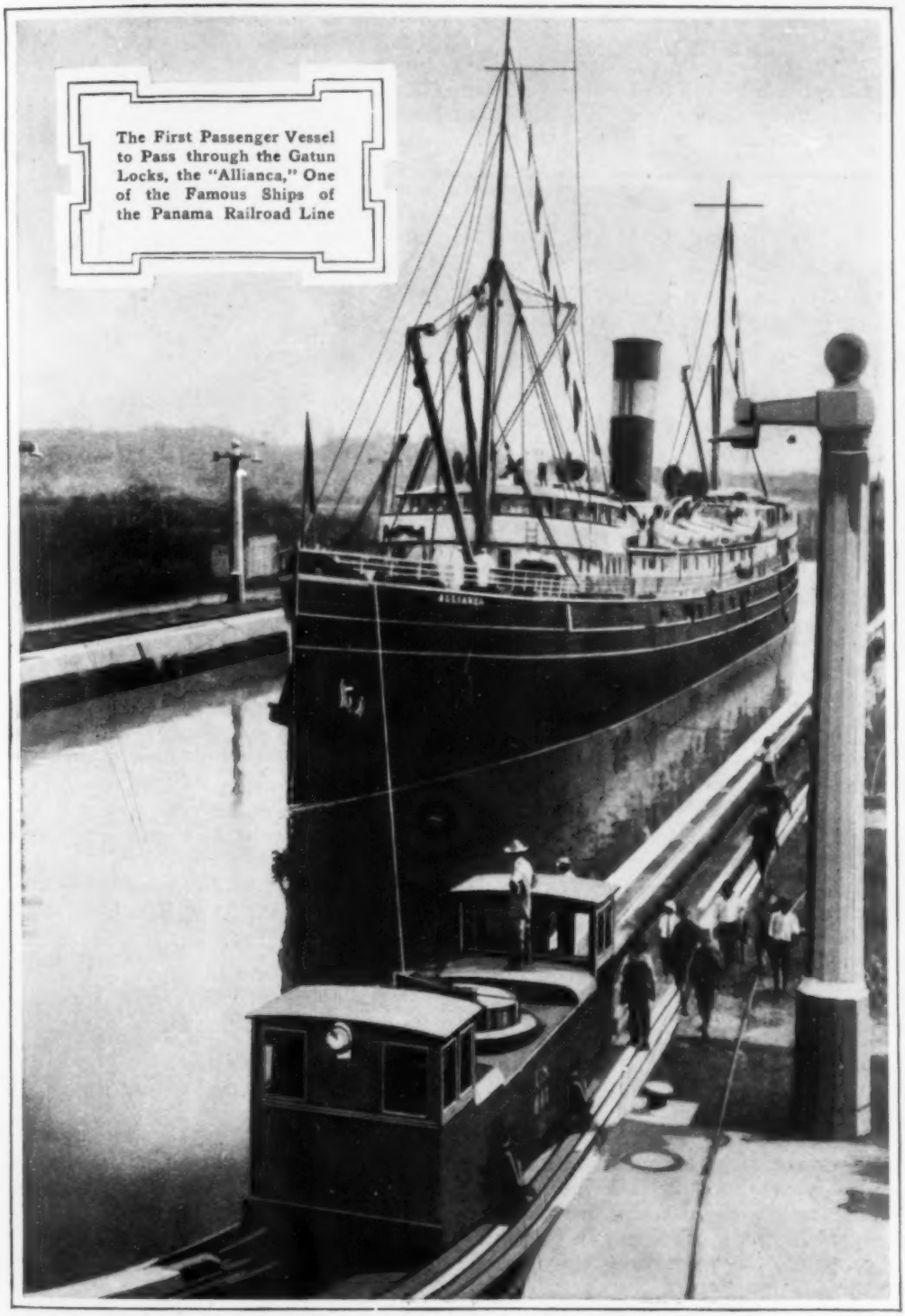
THE electric "mules" or towing locomotives that will handle ships through the locks of the Panama Canal have already been given several tests in actual service. One of these occurred on June 8, 1914, when the 4,000-ton steamship "Allianca" was taken through one set of the Gatun locks into Gatun Lake and then returned through the other set to the approach channel on the Atlantic side. Both operations were carried out without incident, the time required for the trip each way being about 1½ hours. Six days later the seagoing dredge "Culebra," a vessel of 3,000 tons, made a continuous trip through the canal in about nine hours. The early opening of the canal to merchant vessels, according to a statement by the canal authorities, depends on the stoppage of the slide at Cucaracha. For several weeks before the passage of the "Allianca" through the Gatun locks the control board and lock machinery had been subjected to a series of tests, the lock chambers being filled and emptied and the gates opened in exactly the same order as would have been required in handling a ship. The Gatun locks are now reported as completed, with the exception of the fender chains, which have not yet been installed.

A giant dipper dredge with a capacity of 15 cu. yd. for use at the Panama Canal, is now being towed by a tug from New York to the new waterway. It is a twin of one now in use at Culebra Cut and has a dipper 10 ft. 9½ in. in height, fitted with manganese-steel lips. The handle is 72 ft. in length and weighs 40½ tons, while the dipper boom is 62 ft. long and weighs 66½ tons. The two dredges can dig 50 ft. below the surface of the water.



Electric "Mules" Taking the First Tow of Barges through Gatun Locks: The Barges have Just Entered the Lower Lock Chamber Where the Water Is Still at Sea Level

COPYRIGHT, INTERNATIONAL NEWS SERVICE


The First Passenger Vessel to Pass through the Gatun Locks, the "Allianca," One of the Famous Ships of the Panama Railroad Line

The Photograph Shows the "Allianca" in the Second Level of the Gatun Locks

CONCRETE STREET AND NUMBER SIGNS

Street names and house numbers are conveniently designated in Pasadena, Cal., by means of small concrete signs

Concrete Signs on the Curbing Make It Easy to Find Locations in Pasadena

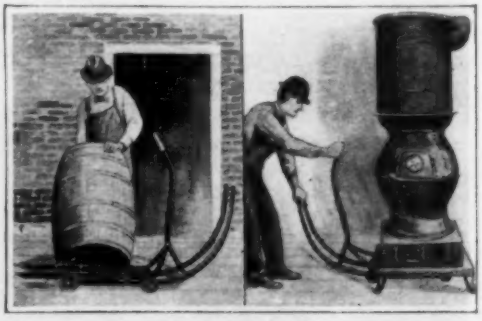
set on the curbing. The concrete blocks bear the appropriate lettering or numbering inset upon a sloping surface, and are easily read from some distance. In some cases the signs are painted white, making them more conspicuous, especially at night. The cost is small and the convenience great.

FINISH CATHEDRAL BEGUN CENTURIES AGO

The Cathedral of Arezzo, Italy, the cornerstone of which was laid in 1277, or 637 years ago, has just been completed and a big celebration is being planned in honor of the event. Periods of centuries have not been uncommon in the construction of European cathedrals and other public buildings, and there are many buildings in Italy started several centuries ago that have never been finished and probably never will be. Such long periods of construction have rarely proved successful, as, owing to the effects of the weather on the old parts of the structure and to the changing tastes of the people, the new work is likely to be badly out of harmony with the old, resulting in an effect that has been compared to a "sugar decoration on a wedding cake." The Arezzo Cathedral is said to be completely successful, the finished structure forming a harmonious and beautiful example of Italian Gothic architecture.

ALL-STEEL TRUCK SAVES HEAVY LIFTING

The handling of heavy articles, loaded barrels, stoves, and the like, presents difficulties to the merchant and manufacturer which are readily solved by the use of an all-steel truck, mounted on four small wheels or rollers, and having a movable platform which can be raised by the use of a lever, clearing the floor when extended, by 7 in. The frame of the truck projects forward, and ends in points having an acute angle, so that, by slightly tilting the truck, heavy barrels, bales, boxes and cases may be slid upon the truck without actually lifting them. Once in position on the frame, a movement of the lever raises them where they can be



New Form of Steel Truck for Heavy Handling

handled easily, the wheels permitting quick transportation to any part of the warehouse.

PUTTING A SUNKEN CONCRETE ELEVATOR ON ITS FEET

Starting the Dangerous Work of Driving Tunnels under the Sunken Elevator: From the Bottoms of Tunnels Shafts will be Sunk for the New Concrete Piers

All Excavated Material from the Tunnels and Shafts is Conveyed to the Trench at the High Side of the Building, Then Removed by an Endless-Belt Conveyor

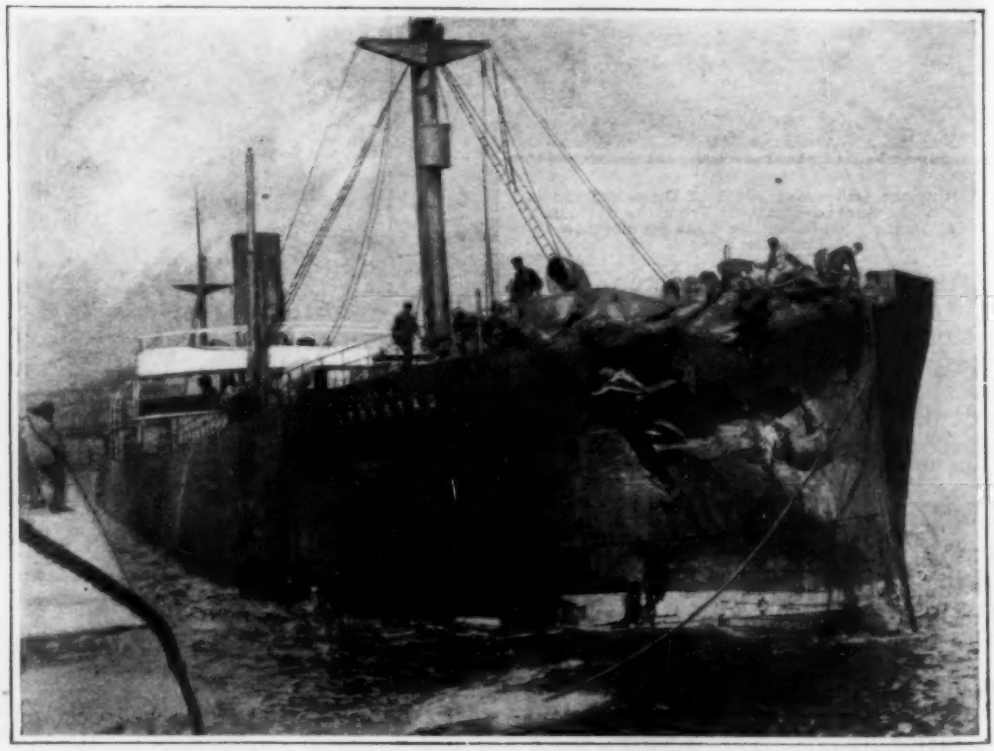
A difficult and costly piece of work that is believed to be unique in the history of building operations is now being carried out at Winnipeg, Canada. This work consists of nothing less than restoring to its upright position, and finally to its original level, the 20,000-ton concrete elevator that sank into the ground and tilted about 30° out of plumb last October, as described in the January, 1914, number of this magazine. As a preliminary to the work on the elevator it was necessary to construct concrete piers resting on bedrock under the adjacent workhouse, 180 ft. high, to prevent any possible disturbance of the foundations of that building. The work of righting and raising the elevator will be accomplished by means of 70 concrete piers, extending 50 ft. to bedrock, on which powerful screw jacks will be put to work to lift the building back to its original position. Work on the piers is

difficult and has possibilities of a great deal of danger. Tunnels 15 ft. apart are driven under the elevator from the high side, and from these tunnels the pier excavations are made and the concrete placed. As a precaution against overturning and to assist in righting the building, heavy shoring equipped with powerful jacks has been placed at close intervals against the low side of the building. The excavated material is removed by a system of endless-belt conveyors.

DAMAGE TO SHIP THAT SANK "EMPRESS OF IRELAND"

Although able to keep afloat, the "Storstad," the collier that rammed and sank the "Empress of Ireland," was itself greatly damaged by the terrific force of the collision and had to be handled with the greatest care to avoid sinking during its subsequent trip up the St. Lawrence to Montreal. The damage to this ship was confined to the bow, and mainly to the starboard side, where the heavy steel plates were crushed and bent like so much cardboard, and seams were opened to within a few inches of the waterline. The anchor hanging over the starboard side of the bow was forced back and firmly imbedded in the mass of broken steel with the sharp point of the fluke projecting from the side of the ship. In this position it is thought to have acted like an enormous can opener, ripping open the steel side of the "Empress of Ireland" from amidships to the stern. From evidence found on the projecting point it is also believed that this anchor was the direct cause of the death of many of the passengers.

¶The prehistoric cliff dwellings in southwestern Colorado, formerly accessible only by horseback, can now be reached by wagon road.



COPYRIGHT, UNDERWOOD & UNDERWOOD, N. Y.

The Collier "Storstad" as It Appeared after It had Rammed and Sunk the "Empress of Ireland": The Anchor Projecting from the Bow is Thought to have been Responsible for Much of the Damage to the Passenger Vessel

PHOTO BY PAUL THOMPSON

Memorial to "Titanic's" Wireless Operator

ENGLISH ERECT CLOISTER FOR "TITANIC" HERO

Near the parish church at Godalming, a little market town on the banks of the Wey, not far from London, a cloister has been built to the memory of Jack Phillips, a wireless operator of the "Titanic," who died at his instrument while flashing "S O S" calls out from the sinking liner. The secluded spot occupies a plot 80 ft. square and is surrounded on three sides by an arcade. In the middle of the grounds, which is a veritable garden, is an octagonal lily pond. Inlaid in the wall beside the water is a carved memorial tablet.

PORTABLE CATAMARAN IS A SPEEDY CRAFT

Carried as easily as a suitcase, and assembled quickly, a new portable catamaran capable of developing a speed of between 8 and 12 miles an hour, has been invented. The air containers are made of rubber, which is covered with a waterproof canvas, and are inflated with an ordinary bicycle pump. All the mechanical parts, including the frame and seat, are made of aluminum bronze, and may be folded into a compact space. The propeller, which is geared for 1,000 revolutions a minute, is furnished its power by a hand gear similar to that of a bicycle. The rudder is controlled by a slight movement of the seat.

Odd Device is Easily Carried. Catamaran is Fairly Stable and Develops Speed

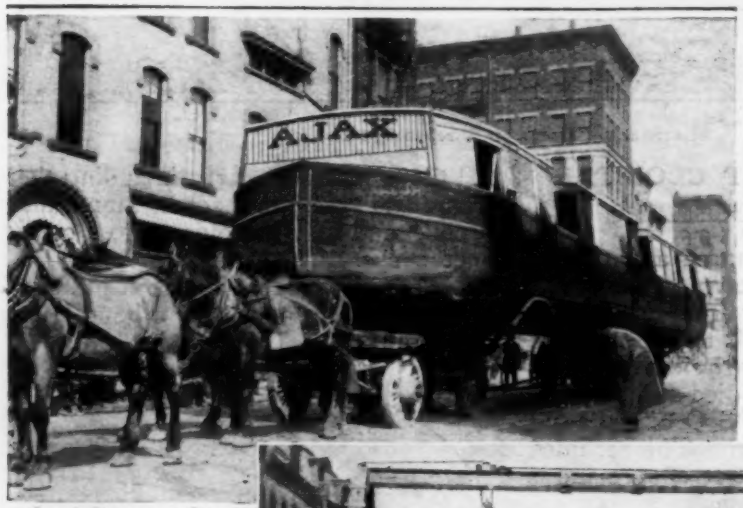
¶What is said to be the tallest dam in Europe is 204 ft. in height.

Hauling Lumber with a Motor Truck over a California Highway

AUTO TRUCK HAULS LONG LUMBER TRAIN

A heavy motor truck was recently employed to propel a long lumber train over a lengthy stretch of California highway. While the machine drawing 12 cars weighted down with building material formed a curious sight, it also illustrated the varied purposes to which the powerful trucks may be put successfully. It is believed that the train was the longest and heaviest load of construction material ever transported over a country road by such a vehicle.

CANAL BARGES ON OVERLAND VOYAGE



Canal Barge on Its Voyage through the Streets of Cincinnati

Five canal barges, each 150 ft. long and weighing 20 tons, were loaded on trucks and carried through the streets of Cincinnati for 20 blocks recently as they started on a voyage down the Ohio River and up the Mississippi and Illinois rivers to the Chicago Drainage Canal. These barges had been plying the Miami and Erie Canal, and as this canal and the Ohio River have no navigable connection, transportation overland was the only way of getting the barges into the river. A power-

How the Barges were Lifted Out of the Canal and Loaded on Trucks

ful rigging was built over the canal and with this as a support the barges were lifted from the water one at a time by steel cables, shifted out over the bank and lowered on the truck. To place one of the barges on its truck required two days of hard work, while another day was required for hauling it to the river.

BUILDING MATERIAL MADE OF ASBESTOS AND CEMENT

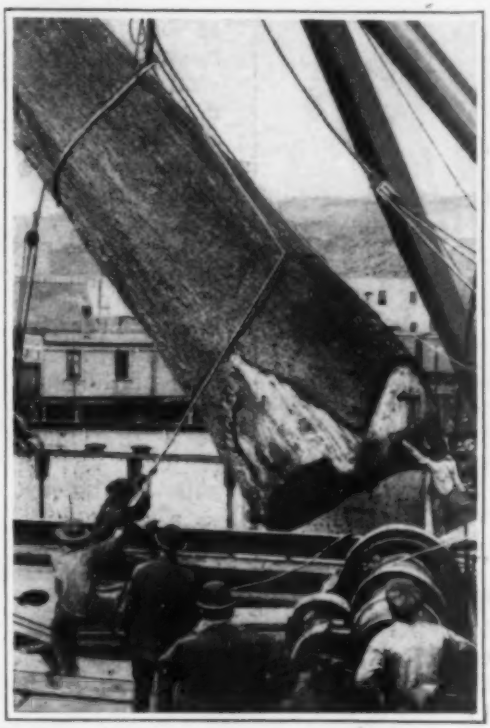
A new fireproof building material that has been developed in Switzerland and is apparently coming into favor in other parts of Europe is made by mixing Portland cement and asbestos fiber and then compressing the mixture under a high pressure. It is usually made in slabs 1 in. thick, 4 ft. wide, and 15 or 16 ft. long. The slabs may be cut in the factory to any shape required, and this material can therefore be used not only for roofing, exterior facing and interior finish of buildings, but for stair balustrades and some classes of furniture as well. The natural color given this material by its ingredients is gray in varying shades, but by mixing iron oxide, peroxide of manganese, and other chemicals with it, almost any color desired may be obtained.

ROADS OF U. S. OVER TWO MILLION MILES LONG

Tabulated figures made, following an exhaustive investigation conducted by a Congressional committee, show that approximately 1,003,000 miles of public highway are traversed in the rural delivery of United States mail. By this it has been asserted that the estimate made by the Office of Good Roads, placing the total mileage of the roads of this country at 2,225,000, is substantially correct. The magnitude of the interwoven system can be appreciated by comparisons which show that the road mileage of the United States is greater than that of all the principal countries of Europe combined.

LOADING BIG LOGS FOR EXPORT

From Puget Sound ports immense logs of fir are shipped in increasing quantities to Japan, where they are made up into lumber in modern sawmills. The photograph was taken while one of these logs, 40 ft. long and 8 ft. in diameter, was raised from the docks preparatory to being lowered into the hold of a Pacific freighter. Just after the picture was taken, the electric power operating the winches gave out, and the brake could not withstand the terrific strain. The big stick, weighing some 40 tons, crashed down on the dock, wrecking the winch and loading gear and creating havoc on the deck, entailing damage to the extent of $3,000. Almost miraculously the stevedores escaped injury.

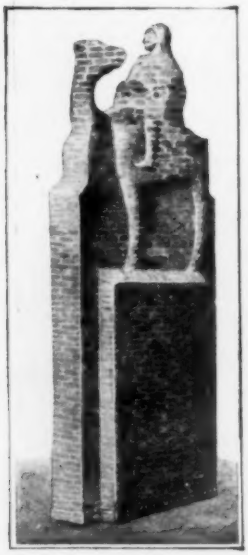


Giant Log Wrecks Apparatus Used in Loading

¶Physicians in Berlin have telephones that connect their front doors with their bedrooms.

GERMAN CITY BUILDS BRICK STATUE TO EXPLORER

The citizens of Vegesack, a small town near Bremen, in the heart of the German clay fields, are soon to erect a curious statue to one of their number who won fame as an explorer in Africa. The monument is to be of brick, and will be 33 ft. in height, including the pedestal. It is the purpose of the architect to mold the figures of the man and camel out of a solid mass of clay, which will be burned in a great kiln, and then sawn into brick-sized blocks. As brick shrinks from 15 to 16 per cent in burning, the architect estimates that the shrinkage will just about equal the amount of cement mortar that it will be necessary to use between the bricks in erecting the statue.



AUSTRIAN PIPE IS MADE OF ASPHALT PAPER

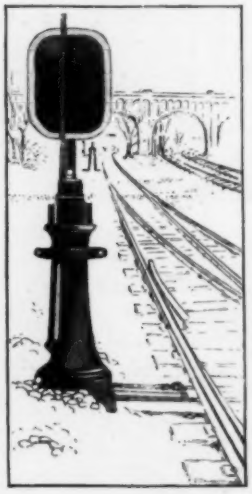
Asphalt-paper pipes, which are claimed to have points in their favor, have been introduced in Austria. The tubes are made of an especially prepared asphalt paper of German manufacture, and are exceedingly light in weight as compared with piping of other materials. They were originally made for electric-cable conduits, but it has been found that they may be used for varied purposes, replacing iron, steel and clay pipes excepting as conveyors of hot fluids, strong acids or petroleum products. One of their advantages is that stray currents of electricity do not affect them.

STEEL BULKHEADS PROTECT STORE FROM FLOODS

During high-water periods certain sections in the lower part of Pittsburgh, which is at the junction of the Allegheny and Monongahela rivers, are subjected to oftentimes serious floods. In 1907, one of the department stores was protected by heavy wooden bulkheads which were placed over the doors and windows. As a result of the success of these temporary boards, permanent steel bulkheads have been made and so arranged that they may be put in place within a few minutes. Steel angle uprights are fastened to the stone work around the windows. These have holes which permit the plates to be bolted in place when needed, keeping the interior of the store safe from water.

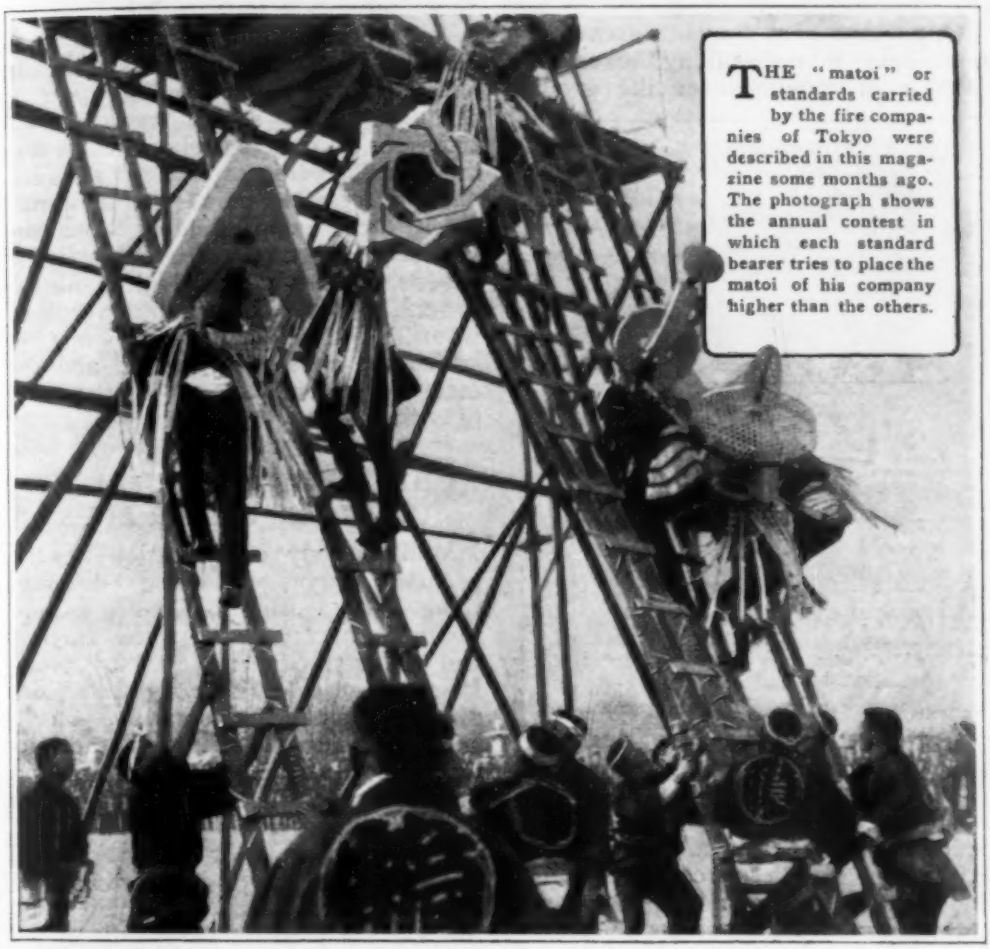
A GREEN SIGN WITH WHITE BORDER EASILY SEEN

By painting a white border about the green target on switches, the Pennsylvania Railroad is promoting the safety-first movement, as the target is much more readily seen against the background of trees and bushes when painted in this manner. The red target is not changed, as it is easily seen without the addition of a border.



¶Because its owners refused to pay back taxes, the eastern half of the Merchants' Bridge, spanning the Mississippi at St. Louis, recently was sold for $11,082. The original cost of the structure was nearly $2,500,000.

CURIOUS STANDARDS CARRIED BY TOKYO FIREMEN



THE "matoi" or standards carried by the fire companies of Tokyo were described in this magazine some months ago. The photograph shows the annual contest in which each standard bearer tries to place the matoi of his company higher than the others.

COURTESY OF THE GRAPHIC

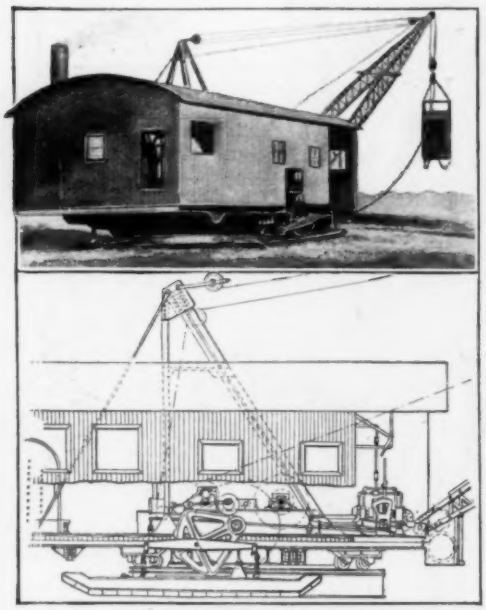
AMERICAN BUSINESS INVADES PANAMA

A tract of land comprising over 10,000 acres and situated on the Caribbean coast of the Republic of Panama has been bought by an American company and is to be converted into a cocoanut plantation. The land lies between Bocas del Toro and Colon, has a coast line of 25 miles, and includes a natural harbor that will provide a safe and ample port at all times for vessels of moderate size. The planting of 2,000 acres to cocoanut trees has already begun, and it is probable that within a short time the entire tract will be under cultivation. The plans include the building of a modern plant for extracting oil from the dried cocoanut meat and the installation of fiber machinery for utilizing the outer husk of the cocoanut in making rope, matting, rugs, and other fabrics.

¶ Photographs snapped at the Baltic Exposition were taken to a Stockholm newspaper via aeroplane, recently, in order to enable their publication the following morning.

EXCAVATING MACHINE THAT WALKS

One of the new things in excavating machinery is a "walking" excavator capable of moving over the ground



Excavator Lifted Clear of Ground by Revolving Sector

The Excavator Walks by a Simple Mechanism Consisting of a Shaft, Sectors, Lifting Beams and Shoes

under its own power and of turning any angle or curve readily without skidding. This machine is particularly adapted to digging drainage canals, as it not only can move about to different parts of the work, but can easily walk across country if necessary from the head of one lateral canal to the head of the next. The excavator revolves on a circular turntable or base which forms its support when working. Across the frame of the machine is a shaft which is arranged to be thrown into and out of gear with the loading drum. Attached to each end of this shaft is a cast-steel sector to which is pivoted a horizontal lifting beam, and from each of these lifting beams a shoe or platform is suspended. When the machine is to be moved, the shaft is thrown into gear with the loading drum, and the shaft, with the sectors at each end, starts revolving. As a sector moves upward and forward it lifts the shoe and sets it forward 8 ft. As the sector continues in its revolution, it comes to a bearing on the top of the shoe, lifts the entire machine clear of the ground, and sets it forward 8 ft., the shoes serving as supports while this operation is being carried out. As the shoes are carried on the upper framework, there is no skidding when the machine is turned on a curve. The shoes are simply raised clear of the ground and the machine is revolved into the desired line of direction, after which the shoes are lowered and the machine moved ahead in the new direction.

QUEER VEHICLES USED BY CORSICAN WATER BOYS

While nearly every nation has its peculiar ways of doing different things, the tourist in Corsica cannot restrain interest in the water carriers and the methods employed by them. It is not an infrequent sight to see a number of small barefooted lads strolling unconcernedly through the picturesque streets of Carghese, pushing before them what to the stranger appears a curious roller. At the end of poles, which are 5 or 6 ft. in length, heavy wheels, approximately 6 in. in diameter, are axled. Suspended by ropes or straps from the middle of the poles swing urns filled with water. Women carrying similar vessels on their heads are often seen, as in other

COURTESY OF THE CAR

Corsican Water Carriers Use an Odd Vehicle

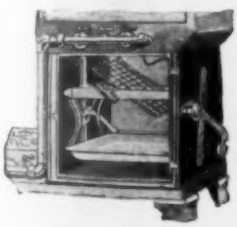
of the Romance countries. It is in this manner that the family water supply is secured from near-by springs and streams and carted to the home.

WIRELESS TELEPHONE FROM LONDON TO BERLIN

That the wireless telephone has at last been developed to such a stage that it is a practical means of long-distance communication was demonstrated recently when a wireless-telephone conversation was transmitted from London to Berlin, a distance of about 600 miles, by means of Marconi transmitting and receiving instruments. This feat far surpasses anything that has been done heretofore, the latest success along this line having been the establishment of wireless-telephone communication between Philadelphia and New York City.

THE BROILING OF MEATS IS SIMPLIFIED BY DEVICE

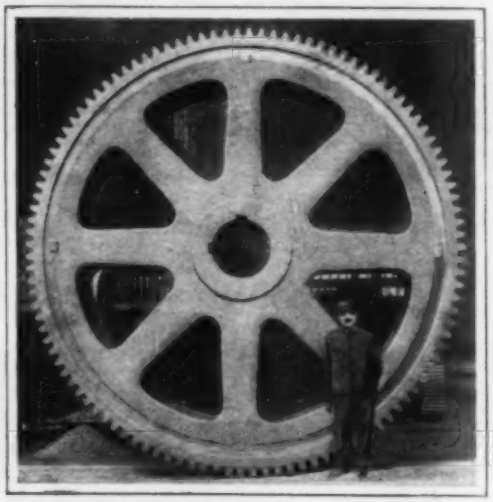
Inconvenience of broiling meats in the old-style gas range has been overcome by the application of a device now being fitted in the oven. The new arrangement consists of a metal frame which holds the grid and dripping pan. It is so fitted that by the use of an outside lever it is possible to place the broiler in any desired position in relation to the fire. The grid also may be removed part way from the stove, allowing the meats to be taken out without handling the hot broiler. The holder is so balanced on the frame that it may be turned over, exposing the meat on both sides to the flame, by a simple operation.



¶ Delegates representing several nations met recently in Norway to frame a government for the Spitzbergen Islands, known as "No Man's Land."

ENORMOUS GEAR WHEEL FOR RAIL-ROLLING MACHINE

One of the largest gear wheels ever made is the 22-ton wheel for running the rail-rolling machine in a newly built steel mill. This enormous gear wheel has a diameter of over 13 ft. and measures 24 in. across the face. It is of cast steel and has 110 teeth, each of which has been carefully ground to the proper shape.



This Gear Wheel, One of the Largest Ever Made, Weighs 22 Tons and Is 13 Feet in Diameter

TO HEAR YOURSELF AS OTHERS HEAR YOU

An English voice specialist has invented a machine which enables a singer to hear his own voice, just as it sounds to his audience. The demand for such a contrivance has been so great that countless adaptations of the phonograph and of the telephone have been tried out in the endeavor to obtain a correct reproduction of the voice of a speaker or singer, so that he can criticize his own delivery, and modify his tone to obtain the best results. All these devices lacked in some essential feature, but the new machine, called the "critophone," is claimed by the inventor to overcome objections urged against other models.

A BERLIN PARK HAS A FAIRY-TALE FOUNTAIN

The "Maerchen-Brunnen" or Fairy-Tale Fountain. Below, a View across It

"Puss in Boots," "Little Sister," and "Red Riding Hood" Portrayed in Stone

FIGURES FROM FOLKLORE CARVED IN STONE

Famous Sculptors Carved These Statues in the Friedrich Park, Berlin

Above is "Sleeping Beauty," at the Left "Aschenbroedel," Whom We Know as "Cinderella," and at the Right "Happy Hans" and His Pig

MIKADO'S STATUE VEILED FROM PROFANE EYES

Although a statue of the late emperor of Japan, Mutsuhito, was recently completed, it has been carefully screened from public view, or, as considered by the imperial family, profane eyes. The work was done by a native sculptor for the dowager empress, now dead, and was intended for her palace. Before the unveiling, which took place a short time ago in the strictest privacy, a photograph was taken from which three prints were made; one for the present empress, another for the minister of the court, and one for the sculptor. It was from the latter photograph that the accompanying picture was reproduced. Before this was allowed, however, the features of the late emperor on the print were half concealed behind a "sudare," a semi-transparent bamboo curtain. It was under this consideration only that the reproduction of the picture was allowed.

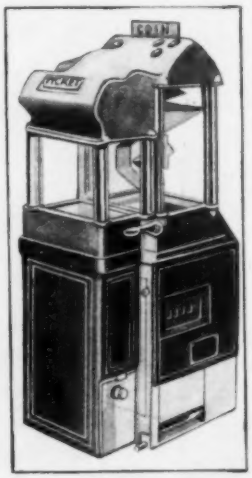
COURTESY L' ILLUSTRATION

EXPERIMENTAL HIGHWAYS STUDIED BY EXPERTS

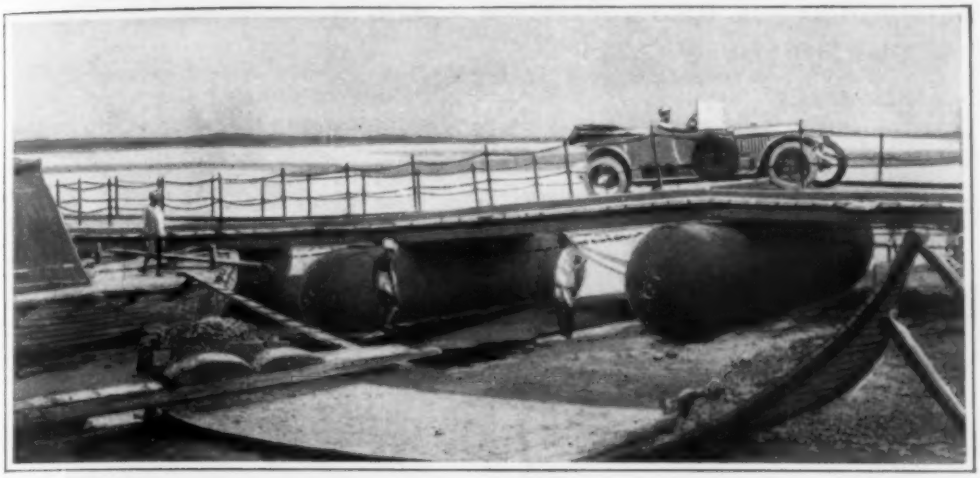
About 12 miles of experimental highways have been built in and near Washington, D. C., under the direction of Federal authorities, for determining what methods of construction and what materials are best for meeting different conditions of road construction. Over these sections of highway go every kind of traffic, and the efficiency of the different types of construction and of the different materials used is being determined by actual test under service conditions. This system is, in fact, simply an application to road construction of the laboratory methods of study now so extensively used by the government departments in other lines of investigation. Practically every system of construction and a great many kinds of material are represented in these highways, and it is planned in future extensions to include as nearly as possible every kind of road-building material. That this exhibit is regarded as of the greatest value is evident from the fact that road experts from all parts of the country, and in one case from Japan, have already visited Washington for the purpose of studying these highways.

DEVICE CANCELS TICKETS ON CARS

A ticket-canceling device, designed to be used on interurban or other transportation lines employing electricity, has been recently brought out. It is an attachment to the common form of registering fare box which receives coins, and is made necessary by the adoption of tickets on some portions of the lines. There is a receptacle for receiving tickets, above which the canceling device is mounted. Tickets thrust through the opening slot pass between a pair of hollow rolls equipped with inking pads, so that they are stamped and canceled indelibly before being deposited in the lower box. The rolls are driven by a small motor, taking power from the car circuit, and revolve continuously.



¶Women will be admitted as contestants in the Olympic games of 1916.



COURTESY OF THE CAR

Motoring through India Presents Many Interesting Features, None More Picturesque Than the Pontoon Bridges across the Rivers. They Vary from Rude and Insecure Affairs, Which Rock and Strain, to the Substantial Structure, Floating on Steel Cylinders, across the Ganges at Allahabad

A PIANO BENCH USED AS A MUSIC CABINET

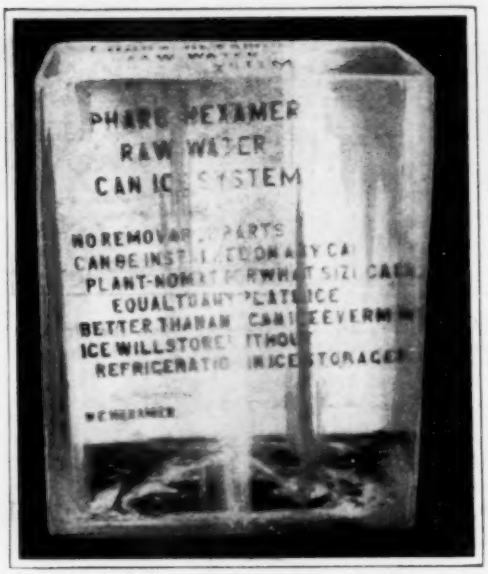
The latest addition to music-room equipment is a combination piano bench and music cabinet, recently invented. The top of the bench is in three hinged sections, covering three separate compartments arranged for keeping sheet music in orderly array. The end pieces are also hinged, and swing away from the bench, allowing ready access to any piece of music desired. It is not even necessary to arise from the bench in order to take out or replace a selection from either of the end compartments, which are equipped for vertical filing.

Convenient Arrangement for Music Lovers

¶That men can be injured or killed by the atmospheric vibrations set up by projectiles in flight is the opinion expressed by a Belgian professor. In the Balkan war cases were known where soldiers died without wounds, apparently from this cause, while there were many cases of serious injury for which no other reasonable explanation could be made. With projectiles thrown at still higher speeds this may become a serious menace in future wars.

CORELESS ICE MADE WITH UNDISTILLED WATER

Manufacture of absolutely clear ice, free from opaque cores and air holes, and without the use of distilled water,



Clear Ice Made of Raw Water by a New Process

has been accomplished through the agency of a pump which keeps the freezing water in circulation without aerating it. Agitation of the water is necessary for the production of transparent ice, but in the past this has been difficult to secure without blowing air into the containing tank, which results in the formation of opaque center cores.

The new device, which overcomes the trouble and makes possible the use of raw water, cutting fuel cost in half, consists of a pump which fits under the framework of the tank. When in operation, this withdraws approximately a quart of water from the can and on the next stroke forces it back. In this manner circulation is gained without aeration. The water freezes clearly and solidly.

¶The Japanese battleship "Fuso" was recently launched with all the engines and guns in place.

AIR SCOUTS' EFFICIENCY PROVED BY TESTS

Effectiveness of the aeroplane for scouting duty in the army is illustrated strikingly by results attained recently during trials made at San Diego. Four men in two air craft accomplished in 53 minutes what military authorities claim it would have required four days for infantrymen to duplicate.

Several bodies of troops were given definite instructions regarding their movements and then dispatched to the eastern part of San Diego County for maneuvers. On the following morning two air scouts, accompanied by pilots, set out to make a detailed survey. Just 53 minutes later they returned with data showing the locations of the different commands, estimates of their number, exact positions, nature of the country in which they were operating, and the rate and direction of their movements. By checking over the records, the information was found to be exact. In the estimates of the number of men, the scouts missed the correct figure by only twenty.

MONUMENTAL GROUP FOR NEW YORK STATION

A monumental group typifying the art and science of transportation is to crown the main entrance of the new Grand Central station in New York City. This group, which will rank with the world's greatest monuments, will be of solid limestone laid in 18 courses and will be 65 ft. wide and 50 ft. high. The principal figure is that of Mercury, the messenger of the gods, which will occupy the center of the group and will be 27 ft. high. Immediately below this figure is an enormous clock face directly over the center of the entrance, while behind the figure is an eagle with outstretched wings which measure 35 ft. from tip to tip. At one side is a muscular and bearded figure typifying Labor, and on the other side is Minerva reading from the book of Fate.

This Muscular and Bearded Figure is Designed as an Emblem of Labor

Minerva Reading from the Book of Fate

The Completed Monument will Constitute an Imposing Symbol of the Modern Art of Transportation

Placing the Base of Monument over the Main Entrance of the Grand Central Station

KINDLING MADE FROM SAWDUST AND SHAVINGS

Taking sawdust and shavings, which have heretofore been regarded as waste

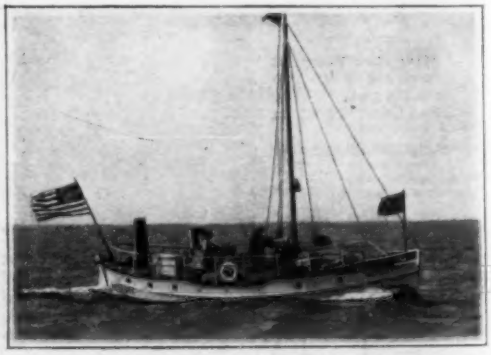
A Machine for Making Kindling Briquettes from Sawdust or Shavings Mixed with Naphthalene

products, and forming them into kindling briquettes, is a new industry recently started in Colorado. The briquettes are made by a machine built for the purpose and are uniform in size, each briquette being about 4 in. long, 3 in. wide and 2 in. high. In the process of making, pure naphthalene, in sufficient quantities to insure ready combustion, is mixed with the other materials, and each block is provided with several holes for the insertion of the fuses used in lighting. One of the briquettes will burn for about 40 minutes.

¶The airship express which makes scheduled trips over the bay between San Francisco and Oakland, Cal., met with its first accident a short time ago when the gasoline feed caused engine trouble. The pilot, who was carrying two passengers, found it necessary to make an immediate landing, and this had to be done on the water. Help arrived within a few minutes and the drenched fliers were rescued.

MOTORBOAT DESTINED FOR LONG TRIP

When the motorboat "Detroit" made the trip from Detroit to St. Petersburg in 1912, running the 5,000 odd miles with but two stops of its engine, it established a reputation for seaworthiness which aroused interest all over the world. This tiny cruiser—the "Detroit" is but 35 ft. long—has now been bought by a Scandinavian magazine, and will be used to demonstrate the commercial possibility of water navigation between Siberia and England. The route contemplated begins at the city of Tiumen, on the Obi River in western Siberia, and runs in a northerly direction for several hundred miles to the Arctic Ocean; then, turning westward, it rounds the island of Nova Zembla, skirts the shores of northern Russia and of Norway, and, crossing the North Sea, terminates at London. The project of connecting northern Asia and European ports by a water route is considered an important one, commercially, and the trip of the motorboat will be watched with interest by merchants



Motorboat "Detroit" Which Crossed the Atlantic and is Now to be Put in Commission over Long Route

and manufacturers on both sides of the Atlantic

¶New Zealand has a stretch of railroad 136 miles long without a curve.

The Power of the Avalanche Sweeps Everything from Its Path

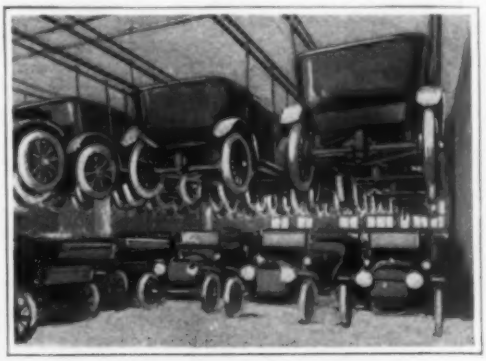
AVALANCHE BURIES FRENCH VILLAGE

A mass of snow and ice swept down the steep mountain side recently, burying the French village of Chamonix, from which travelers usually start for the ascent of Mont Blanc. Houses and shops were buried under 40 ft. of snow and a number of lives were lost. The photograph depicts that portion of the ill-fated village least damaged by the avalanche.

WASTED SPACE IN GARAGE USED FOR STORING CARS

Use of the ceiling of a garage as well as the floor, for storage purposes, is the innovation which serves a useful function for a St. Louis automobile man. Room to accommodate 300 machines at one time was found necessary, but at first sight it was out of the question with the limited floor area at hand. Presence of wasted overhead space, however, suggested the idea of swinging the motors from the ceiling. This was accomplished by the use of heavy steel runners, to which hangers were attached. Steel cables were suspended from these and attached to the wheels of the cars.

When it is desired to swing an automobile, the car is raised on an elevator from which it is transferred to a traveling table and then pushed to its



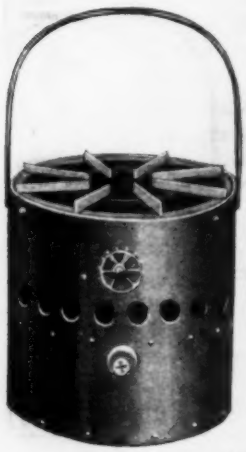
Garage Where Both Floor and Ceiling are Used for Storage Purposes

place. Without trouble it is secured to its hangings and swung out of the way.

¶ By a special form of stoker and grate, German power plants make steam with cinders blown from fire boxes of locomotives.

GASOLINE STOVE IS MADE FOR CAMPING PURPOSES

To meet the demands of hunters, campers, and automobile tourists, a new camp stove is being made which is small and conveniently handled. It uses gasoline as fuel and generates a high-temperature flame which may be regulated to any degree desired. The stove is of cylindrical shape and is about as large as a medium-sized water bucket. Its dimensions are 10 by 10 in. The gasoline supply is carried in the base and is fed to the burner by air pressure.



IOWA TOWN HAS WELCOME FOR INCOMING TRAMPS

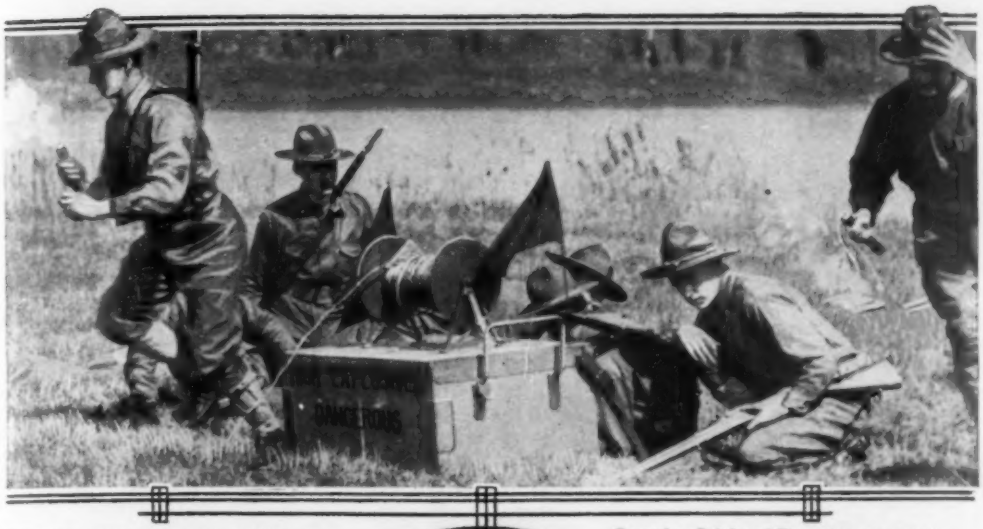
Down by the railroad tracks entering Oskaloosa, Iowa, is a significant sign erected to "welcome" to the city those lesser lights of the traveling public classified as tramps. Incidentally it is so placed that it can hardly escape the attention of anyone arriving at the town. In a different section of the city there is a stone pile, labor for which is usually enlisted from the municipal calaboose. The sign mentions this fact and extends a hand of welcome to the hobo in the following manner: "Notice: This City Has a Stone Pile for Bums. You Are Welcome. Mayor."

BLAST-FURNACE FLUE DUST TO BE UTILIZED

A waste that is serious in the aggregate has heretofore been unavoidable in connection with the flue dust produced in the operation of blast furnaces; this material, which contains about 30 per cent of pure iron, having usually been discarded as waste or used for filling. A process has recently been invented which utilizes the flue dust by incorporating it in the pig iron as it comes from the furnace and before it is sent to the converter. To use this process, the molten pig iron must be allowed to fall a distance of from 4 to 6 ft. into a mixing vessel in order to create a vortex. The flue dust is then discharged through a pipe into the center of the vortex and below the surface, and is taken up by the whirling action of the molten metal and thoroughly incorporated with it. The process is one that can only be used where the metal is to be remelted and subjected to further treatment. The big saving that may be brought about through the use of this process is indicated by the fact that in the Pittsburgh district alone there is an accumulation of flue dust amounting to about 2,500 tons daily, while at one point in this district there is a stock pile of this material estimated to contain more than 1,000,000 tons.

POWERFUL NEW EXPLOSIVE IN ARMY TESTS

In a former issue of this magazine the discovery of a new explosive, trotol, was described, and its tremendous power indicated. Experiments have been recently made by the Demolition Corps of the 22d Engineers, N. Y. State Militia, proving satisfactorily both the safety and the convenience of this new explosive in the field. Trotol gelatin in cartridge form, similar to dynamite sticks, was carried in the hand, thrown upon the ground, placed beneath standing timber and exploded in water with perfect safety to the men, and with remarkable effect.



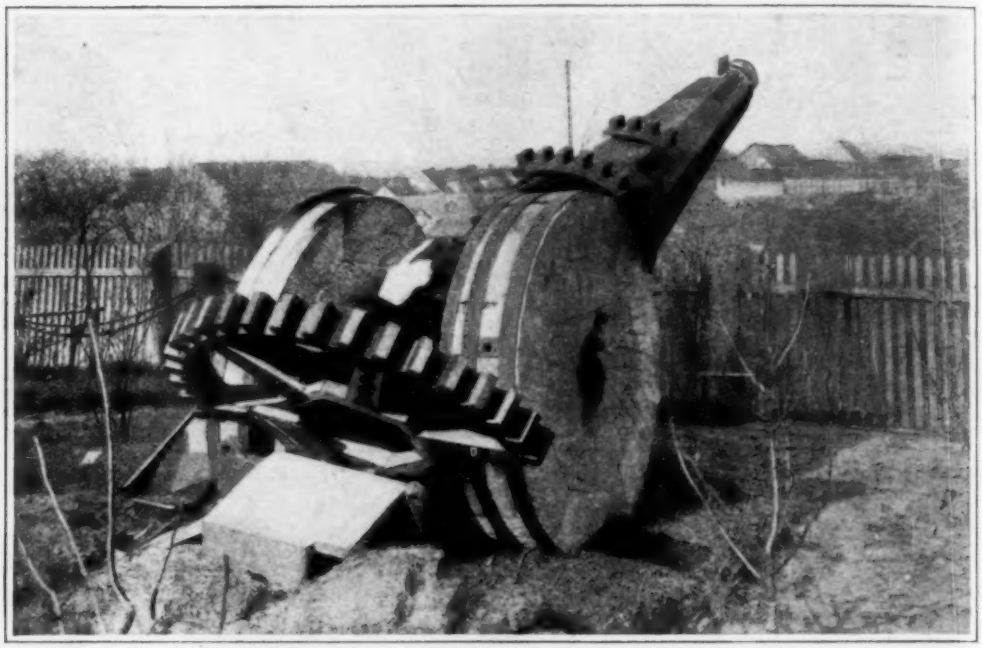
Handling Trotol, the New Military Explosive, in Field Tests

Carrying Sticks of Trotol in the Field

Carrying a Trotol Cartridge with Burning Fuse Attached

Illustrating the Use of the New Explosive for Excavating Rifle Pits Quickly

COPYRIGHT, UNDERWOOD & UNDERWOOD



This Queer Cannon Marks a Medieval Battle Ground

LONG ROPES MADE OF HUMAN HAIR

It is customary when a temple is being built in Japan, that the peasants donate their hair to the deity for whose worship the edifice is being erected. This hair is made into a great rope, and is used to raise the beams of the temple. After being used in this manner, the rope is coiled within the temple and kept as a votive offering to the god. The rope shown in this photograph is 110 ft. long and 4 in. in diameter. Travelers have seen 53 of these ropes in various temples throughout Japan.

¶Two additional subway tunnels are to connect Brooklyn and Manhattan.

CURIOUS OLD CANNON MARKS HISTORIC GERMAN SPOT

Standing approximately on the exact spot where in 1414 Frederick of Hohenzollern, count of Nuremberg, with a heavy cannon partly destroyed Friesack, Germany, today rests a curiously built monument in the shape of a war piece made of log wheels, millstones and wood. The town lies on a branch of the Rhine in Prussia near Potsdam. Close to it is a large estate bearing the same name, whose fortified castle was captured by Frederick after a bitter fight against the rebellious knight Dietrich von Quitzow. It was below the place where the cannon in the accompanying picture now stands that the Quitzows were intrenched.

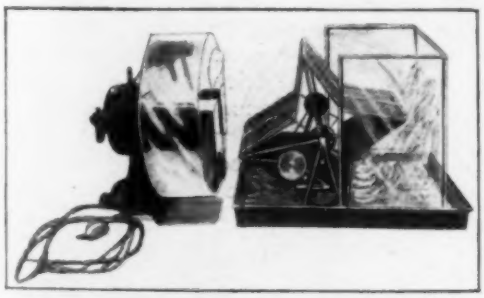
PRIZE FOR BEST BRITISH AERIAL MOTOR

In an effort to stimulate inventors and manufacturers and give Britain the lead over France and Germany in the construction of aeroplane engines, the British War Office is offering a prize

of £5,000 to the maker of the best domestic engine adapted for flying purposes. The tests are being carried on at Farnborough and will last several months. The first demand in the trials is six hours of continuous running on a testing bed. Engines which meet this requirement will be subjected to other work-outs on rocking beds, and tested in other ways at the discretion of the judges. Any competing firm is allowed to enter two engines of similar type, and many already have done so.

A FAN THAT HUMIDIFIES THE AIR

In order to keep the air in living rooms from getting too dry, a device combining the virtues of an electric fan and a humidor has been invented. The fan differs little from the small and familiar household fan, save that it is fitted with a cover, with openings directing the air from the blades upon the humidor. This portion of the device consists of a star-shaped wheel of wire gauze, so fixed that it revolves within a glass frame, dipping successive planes in water, contained within the lower part of the glass. The force of the air keeps the wheel revolving, the air carrying with it moisture from the wire gauze, humidifying the atmosphere, and causing a movement of the air throughout the apartment. Beneath the wheel of wire mesh is a small bell which rings when the water in the glass is exhausted, because the wheel then revolves so fast that the oscillation vibrates the clapper and rings the bell.



An Electric Fan and Humidor for Household Use

A CONVERTIBLE WAGON AND SLED FOR CHILDREN

An all-the-year-round vehicle for children, consisting of a combination wagon and sled, is being manufactured.

Winter and Summer Plaything for Children

When in use as a wagon, the sled runners are turned upward, and fastened in place by a crosspiece at the rear. The runners thus become the side pieces of the wagon. When a sled is desired, the sides are let down, and held in place by hexagonal nuts in the axles. The runners are a trifle deeper than the wheel diameter, so that when they are let down the wheels do not touch the ground. There is a handle for use when the vehicle is a wagon, but it may be turned under and fastened under the rear axle when the vehicle is to be used for sliding.

¶In the survey of the wilds of Bolivia all longitude determinations were made with the aid of time signals sent from a wireless station 120 miles from the base of operations.

GRAVITY TRAINS FOR SAN FRANCISCO FAIR

An interesting novelty in passenger equipment is the roller conveyor that is being planned for handling exposition crowds between the Ferry building at San Francisco and the Panama-Pacific Exposition grounds. The system is of a type that has been in use in factories for years, but this will be the first case of its being used for passenger traffic on a large scale. The cars will operate on an elevated trestle which is made up of a succession of grades having a fall of 3 ft. to 100 ft. The cars, which have flat bottoms and are without wheels, will run on rollers placed at intervals of a few feet along the trestle, an arrangement that will allow the cars to coast easily. At intervals of 400 ft. the cars will be drawn by a cable up a steep incline to a point 12 ft. above the lowest point of the trestle and will then coast to the next cable and incline. There will be 20 cables, each operated by a small electric motor.

This Ingenious Roller-Coaster Railroad is to be Used for Transporting Passengers from the Ferry Building to the Panama-Pacific Exposition Grounds. The Cars will Coast Down an Incline for 400 Feet and will Then be Drawn by Cable to the Top of the Next Incline

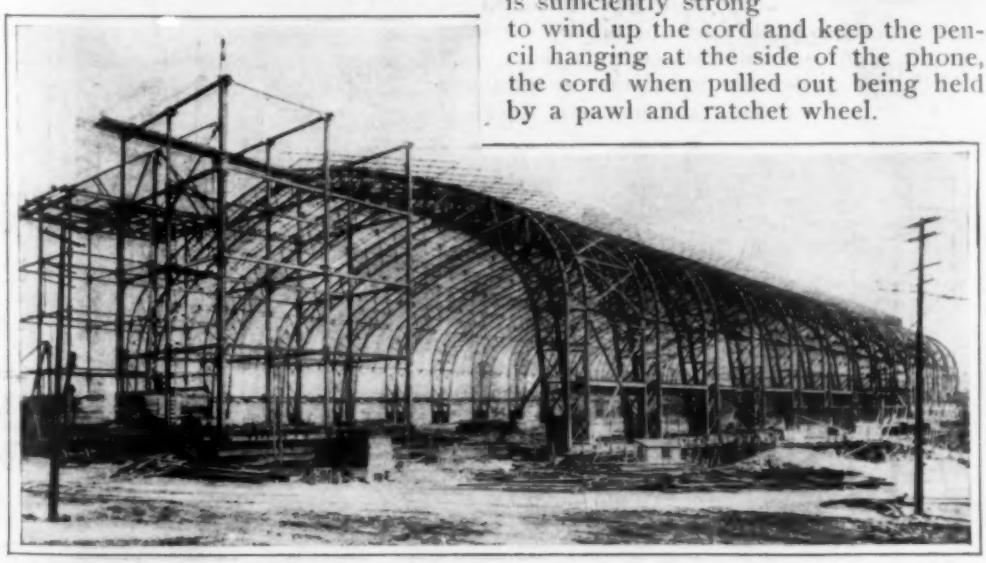
EGGS BROKEN IN TRANSIT

Unintelligent packing of eggs is responsible for a tremendous annual loss, which not only serves to increase prices but also, during certain seasons of the year, obviously makes serious inroads upon the supply. According to figures compiled by the research laboratory of the Department of Agriculture nearly seven per cent of crate-packed eggs arrive at their destination in bad condition. There is a breakage of 24.96 eggs in each of the 4,666,117 thirty-dozen cases received yearly at New York alone. Suggestions aimed to check the waste have been issued by the Department of Agriculture for the consideration of shippers.

¶The states of Arkansas and Mississippi are involved in a suit over the possession of a section of land formerly in Arkansas but now on the Mississippi side, owing to a new channel cut by the Mississippi River.

ARMORY FOR NEW YORK COAST ARTILLERY

What is believed to be the largest armory in the world is now being erected in New York City for the use of the Coast Artillery Corps of the National Guard of New York. This structure, which will rank with some of the biggest train sheds and exhibition buildings in the world, is 600 ft. long and 300 ft. wide, and will therefore cover a ground area of 180,000 sq. ft. The frame of the structure consists of a series of enormous three-hinged steel arches, having a span of 300 ft. and rising to a height of 90 ft. above the floor level. At the center of each of the long frontages will be an entrance tower, 144 ft. high. The armory will serve not only as a headquarters and drill ground for the coast-artillery reserve, but will be used for staging mimic battles between miniature battleships where such contests can be watched by as many as 40,000 persons. The cost of the building is estimated at $1,500,000, and the cost of the gun equipment at $250,000. The equipment will comprise emplacements for a 10-in. disappearing gun, a 12-in. mortar, a 3-in. rapid-fire gun, with fire-control stations, range-finding apparatus, power plant and magazines, all of which will be duplicates of equipment employed at seacoast fortifications. Aside from its size, this armory is interesting as a part of the movement to provide a trained reserve to assist the regular army in case of need.



This Armory, Now being Built for the Coast-Artillery Reserve in New York City, Is One of the Largest in the World, being 600 Feet Long and 300 Feet Wide, and Having a Total Ground Area of 180,000 Square Feet

A PENCIL ATTACHMENT FOR THE TELEPHONE

The annoying delay incident to finding a pencil to take down a number when talking over the telephone is avoided by the use of a novel device by which a pencil is attached to the telephone. A small case, within which a cord is wound up on a spring, is fastened by a blank to the phone, and from the end of the cord a wire loop engages another loop at the top of a clutch-point pencil. The spring is sufficiently strong to wind up the cord and keep the pencil hanging at the side of the phone, the cord when pulled out being held by a pawl and ratchet wheel.

The Ulster Gun Running: The Picture, Drawn from Photographs and Descriptions, Shows How the Ulsterites at the Larne Wharf Unloaded the "Mountjoy's" Cargo of Weapons and Ammunition, and Distributed the Consignments into Automobiles Waiting in Readiness to Dash Out with Arms for the Foes of Home Rule. While the Gun-Running Operations were being Carried Out, Scores of Automobiles Flocked to the Quay from All Directions, to be Packed with the Ship's Cargo

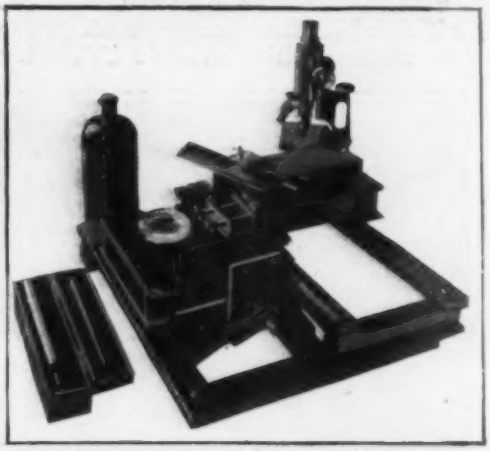
GUN RUNNING IN ULSTER REMARKABLY EXECUTED

Disguised as the "Mountjoy," a mysterious Norwegian steamer believed to have been the "Fanny," entered the harbor at Larne on the Ulster coast during the night of April 24, with a cargo of 35,000 rifles and 1,000,000 rounds of ammunition.

The port, which is about 25 miles from Belfast, was in the possession of a strong force of Ulster volunteers, bitterly opposed to home rule for at least that section of Ireland. With a cordon of men surrounding the place and all means of communication cut off, the quay, merged in darkness, formed the scene of remarkable gun running. Throughout the night and early morning the unloading of the cargo was rushed at great speed by the use of nearly 600 motor cars, which dashed out from the town distributing arms through Ulster. In this manner, with the assistance of approximately 3,000 men, 2,000 tons of rifles and ammunition within a few hours had been carried out from Larne. Small vessels conveyed the rest of the cargo to Donaghadee and Bangor, on the County Down coast, where distribution also was made quickly by the use of automobiles.

MICROSCOPIC LUMBERING OPERATIONS

By the use of the microtome, a delicate instrument for cutting infinitesimal slices, experts working in collaboration with the Forest Products Laboratory at Madison, Wis., are able to judge of the quality of standing timber. This is of real benefit to lumbermen, in that by taking small samples from each tree in a selected area, they can make a selection of the trees to be cut with scientific accuracy. The instrument is a finely adjusted machine with a cutting unit of such remarkable fineness that a ribbon of wood of but one twenty-five-thousandth of an inch in thickness may be removed. For purposes of study the sections cut are ordinarily such that 2,500 of them would make an inch in thickness, but photographic work demands greater exactness, and



With This Instrument Wood is Cut into Sections for Study under the Compound Microscope

the microtome has been so perfected that sections of wood tissue are obtained so minute that upon the screen the individual cells show up distinctly.

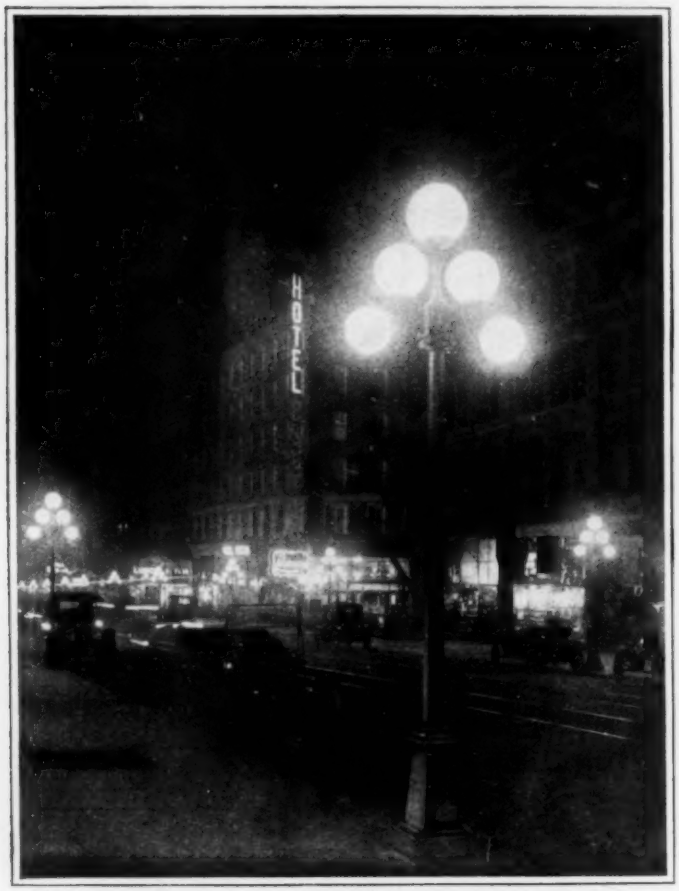
LIGHTING APPARATUS FOR MAKING BLUEPRINTS

A new lighting apparatus for blueprinting and copying that has been brought out in Germany consists of an electric arc with a reflector so shaped that the light is thrown downward with equal intensity over every part of the illuminated area. The purpose of the apparatus is the making of blueprints that will be of uniform color throughout.

¶Conditions for long-distance wireless work are more favorable on the Pacific Ocean than on the Atlantic, where the underlying rocks are thought to interfere with transmission.

USE NITROGEN LAMPS FOR SEATTLE STREET LIGHTING

Seattle, Wash., has been one of the first cities in the country to adopt the new nitrogen-filled electric lights for street-lighting purposes. The contended advantage of the lamp is its efficiency, for it requires less energy per candlepower than other similar lights. The presence of nitrogen at ordinary pressure in the bulbs also protects the metallic tungsten, preventing the blackening of the glass. Great brilliancy is produced by the lamp, which will be used for illumination along the Panama Canal.



Great Brilliancy Given by Nitrogen Lights

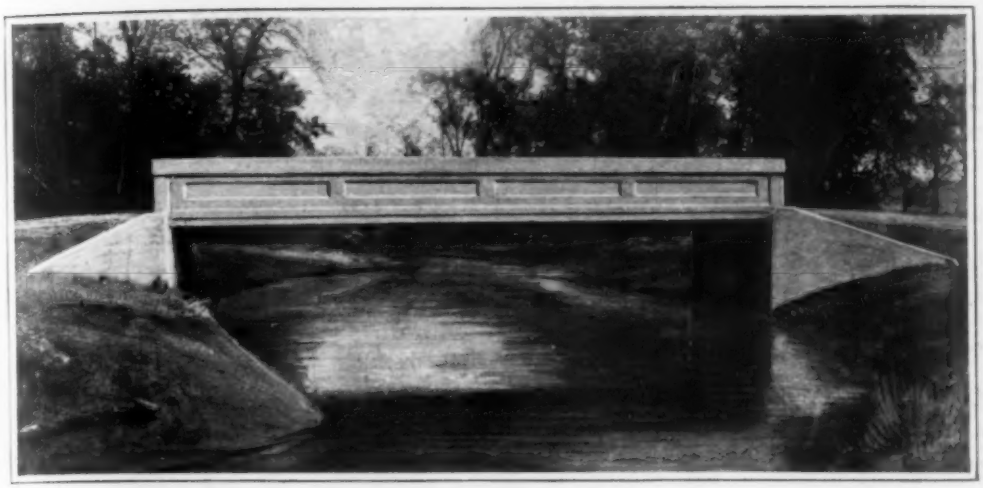
¶A motion-picture exhibit of British industry will tour the world in 1915.

NEW BUILDING STARTED IN BASEMENT OF OLD

Practically completing the foundations for a 20-story building by working in the basement before and during the removal of the existing buildings, is something decidedly new in building-construction methods. The old building was the Victoria Hotel in New York City, and during the early stages of the foundation work the hotel continued in business and the guests did not even know that the work was going on. By the time the old building had been torn down, the foundation work, which is ordinarily the slowest part in the construction of a high building, had been completed and made ready for the steel frame. The foundation piers are composed of concrete-steel piles formed of steel pipes driven to a firm bearing and then cleaned out and filled with concrete. In driving these it was necessary to break holes in the first floor of the building and suspend the steam pile driver from the second floor, while the piles were held in a vertical position by separating frames placed at basement-floor level.

SIXTY-FOUR-FOOT ONE-SPAN CONCRETE BRIDGE

Constructed without an arched support or center pier, a 64-ft. single-span concrete bridge has been built near Edwardsville, Ill. Its strength is sufficient to carry the weight of a heavy traction engine without injury. With



Concrete Bridge with Long Single Span

its abutments and approaches, the bridge is 102 ft. in length; considered long for the form of design, made necessary to facilitate the passage of flood waters. The flooring is one foot in thickness and is supported by means of steel reinforcement bars, which, after passing through the heavy side walls, are bent to enter the flooring. Similar rods are laid lengthwise of the bridge, forming a network over which the concrete was poured.

SUBMARINE MINES FOUND BY FLYING BOATS

In addition to their value in scout duty in connection with military operations, which has been thoroughly demonstrated at Vera Cruz, flying boats have a particular value in ascertaining whether or not a harbor is mined. When the water is smooth, according to a statement made by an officer of the United States Navy, mines cannot only be plainly seen from a flying boat but may be photographed. In a test recently carried out at San Francisco the mine planters placed mines along the coast of the Pacific and then notified the commander of the fleet. All these mines were discovered by airmen who were told that mines had been planted, but who were not given any clue as to their location.

ELECTRIC SIGNAL TELLS OF APPROACHING TRAIN

Operating by means of electricity, a new automatic danger signal, which upon the approach of a train sounds a warning by ringing a locomotive bell and swinging a red light, is being employed by a number of western railways. Swinging pendulumlike, from the top of an iron pole, is a large red disk, within which are electric bulbs which light upon the nearing of a train. When in use the signal lights up, flashing in white letters the word "Stop," and begins oscillating. The bell also rings. Each function of the mechanical flagman operates independently of the others, so that, in case one part becomes temporarily disabled, it does not affect the working of the rest.

EXPLOSION OF MAGAZINE AT PANAMA

By the explosion of a magazine in which the government of Panama had gasoline, dynamite, nitroglycerin and black powder stored, eight persons were killed and 15 injured on May 5, 1914. The magazine was an old masonry building, formerly used as a fortified post, and was located on the Corozal road not far from Panama City. The explosion completely destroyed the magazine, tearing a deep hole in the ground where it had stood, and hurled large pieces of rock for distances of several hundred yards, while the concussion damaged buildings in Panama City and Ancon and was felt at Culebra, Empire, and other towns inland in the Canal Zone. It is reported that the explosion was caused by a grass fire which the Panama fire department was trying to put out, but was unable to control. Some idea of the force of the explosion is given in the illustration showing the damage to a palm tree near the magazine. Not only was the top of the tree torn off, but a stone weighing several hundred pounds was firmly imbedded in the trunk at a height of nearly 40 ft. above the ground.

COPYRIGHT, INTERNATIONAL NEWS SERVICE

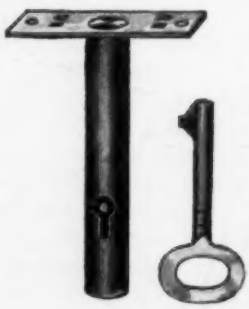
¶In a museum for historic cars in London there are exhibited gasoline cars made as early as 1895, a steam tricycle made in 1881, and one of the earliest steam cars, made in 1869.

MAKING LEGAL TENDER WITH COINS

The greatest amount that a person making payment may offer in silver or copper coins, with the certainty that the other party to the transaction cannot refuse, is commonly known as the "limit of legal tender," and is a matter not of individual opinion but of Federal law. A definite limit is specified for coins of each denomination except gold coins and silver dollars, both of which may be used in making legal tender up to any amount. Of the minor coins now current, one-cent and five-cent pieces are good only up to 25 cents. Dimes, quarter dollars, and half dollars are good in making payments up to $10, while the old silver three-cent pieces, half dimes and 20-cent pieces were each good up to $5. Although it is done as a matter of business custom, there is no law compelling anyone to make change, and as a matter of law a street-car conductor, for example, can refuse to take the five-cent car fare out of a dime just as he can refuse to take it out of a ten-dollar bill.

SMALL LOCK WITH VERTICAL SHAFT

Thin wooden fronts for desk drawers, tool boxes and similar articles present difficulties in fitting locks, and this is sought to be overcome by a German lock having a vertical shaft, which may be inserted by simply boring a small hole in the wood. The lock is nothing more than a cylindrical barrel or tube, with a flanged top having two tiny screw holes. The keyhole in the lower part of the shaft opens two ways, so that the lock may be applied either vertically or horizontally.



COCOANUT OIL A SUBSTITUTE FOR BUTTER

Cocoanut lard, formed from the oil of the cocoanut by combination with hydrogen in the presence of a catalytic agent, such as nickel, is the basis of a new table butter which is coming into use in Europe as an acceptable substitute for creamery butter. The new "lard" is highly refined, blended with milk and churned, after which it is colored and molded into pats and rolls, and finds a ready sale.

Old Way of Drying Copra by the Filipinos

The dried meat of the cocoanut, known as copra, is milled, steamed and pressed to extract the oil, which is but one, although the most valuable, of the 84 recognized products of the cocoanut palm. An English authority places the value of the cocoanut products of 1912 at about $350,000,000, while the world's production of gold in the same year was less than $500,000,000, and the total value of the rubber crop did not exceed $200,000,000. In the Philippines copra is a staple crop, the nuts being gathered and floated in huge rafts to convenient places, broken, and the meat extracted and dried. Modern methods are being introduced there, the United States having sent experts from the Department of Agriculture to make a thorough study of the industry. New steam driers are being installed and copra of better quality is now being produced.

Top View: Floating Cocoanuts to a Philippine Copra Factory

Lower View: A Cocoanut Palm in Bearing, One of About 30 Varieties of This Valuable Tree

Heretofore cocoanut oil, while largely used in the manufacture of soaps and candles, was not considered

edible by civilized peoples; no process having been discovered for solidifying it or for removing the subtle cocoanut taste. Now cocoanut lard is being manufactured on a large scale, and the purified oil is taking the place of animal fats in the manufacture of oleomargarine.

NET CONTENTS TO BE SHOWN ON ALL FOOD PACKAGES

Manufacturers and packers of foods sold in packages and bottles will be required, after Sept. 3, 1914, to show on the wrapper or label the net weight or volume of the contents, as a result of an order recently issued by the U. S. Department of Agriculture. In the case of some classes of articles the contents may be stated by numerical count where this method gives accurate information as to the quantity of food in the package. The figures given on the label must represent the actual quantity of food, exclusive of wrappings and container.

NOVEL CAMERA BUILT TO OBTAIN DISTORTION

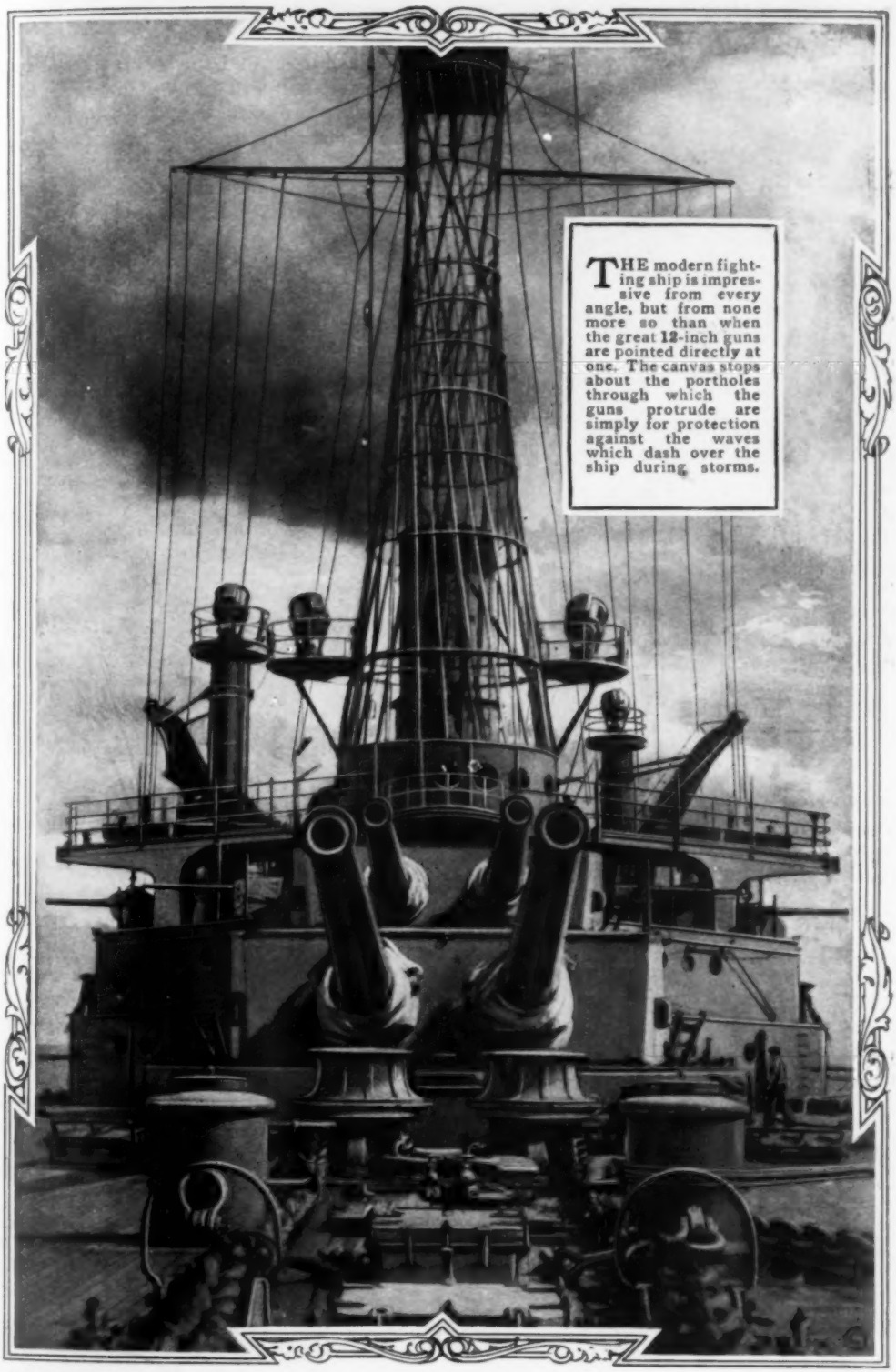
A German engineer has built a camera based on the pinhole principle, in which instead of a small round hole, he uses narrow slits, vertical and horizontal in the two walls, although to vary the effects, other angles are sometimes employed. With this arrangement he is able to obtain exaggerated pictures, showing either vertical or horizontal dimensions out of proportion. By multiplying the number of slitted walls between the exterior of the camera and the plate, and inclining some of them at an angle, he has produced some remarkable photographs. Thus a landscape may be made to appear flat or hilly, or a street scene may be radically changed in character. Architects are using this form to change plans, caricaturists to produce comical distortions, and decorative painters to vary patterns or to produce condensed or extended letter types without altering their character.

A HOMEMADE SUSPENSION FOOTBRIDGE

A suspension footbridge over a creek in the Ozark Mountains in Arkansas was built almost entirely of woven-wire fencing and old wagon tires, only the cables, which cost $20, being bought for the occasion. The cables were stretched and were anchored at each side of the creek, and the tires, which form the floor support, were then bent into rectangular shape with loops at each end. These loops were hooked over the cables and were wired fast so that the tires were suspended in a horizontal position. Woven-wire fencing was stretched along the bottom and a board walk was laid. Woven wire was also stretched along the sides of the bridge, which is 80 ft. long and 5 ft. wide, and cost $50.

This Footbridge was Built Mainly of Old Wagon Tires and Woven-Wire Fencing, the Only New Material in It Being the Cables

GUNS OF THE U. S. BATTLESHIP "DELAWARE"



THE modern fighting ship is impressive from every angle, but from none more so than when the great 12-inch guns are pointed directly at one. The canvas stops about the portholes through which the guns protrude are simply for protection against the waves which dash over the ship during storms.

COPYRIGHT, E. MULLER, JR.

GIANT LINER CARRIES NEW MOTOR LIFEBOATS

Two motor lifeboats are carried on the new "Aquitania." Each is provided with a 30-hp. kerosene engine, which

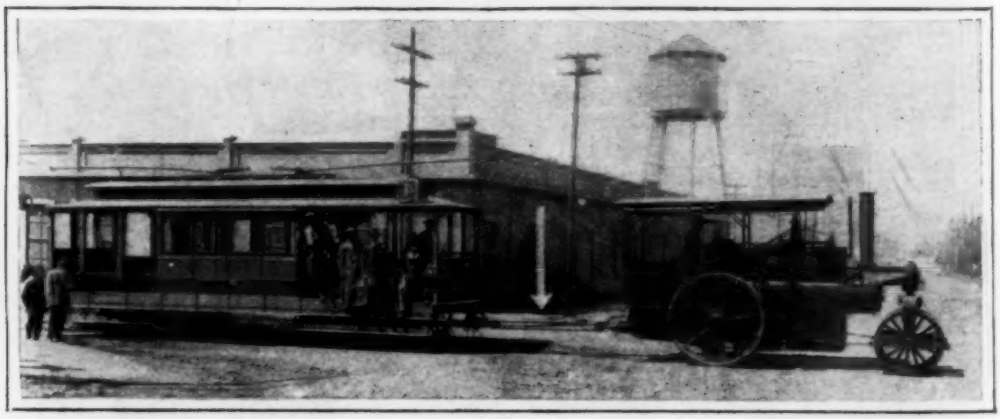
COURTESY ILLUSTRATED LONDON NEWS

Portable Motor Lifeboat Equipped with Wireless

is started with gasoline. After the vaporizer has been heated by the exhaust, kerosene is used for fuel. The fuel tanks have a capacity of 50 gal., which is sufficient to propel the motor 200 miles at a speed of approximately nine miles an hour. The craft are 30 ft. in length, with 9-ft. 6-in. beam. They are designed for towing purposes especially, and in case of accident the ordinary lifeboats would be lashed together and towed. The boats are equipped with wireless instruments capable of transmitting messages to stations within a range of 100 or 150 miles. The aerials are carried on bamboo masts, which may be lowered when not in use. Medical chests, food supplies, water and blankets are carried aboard in compartments.

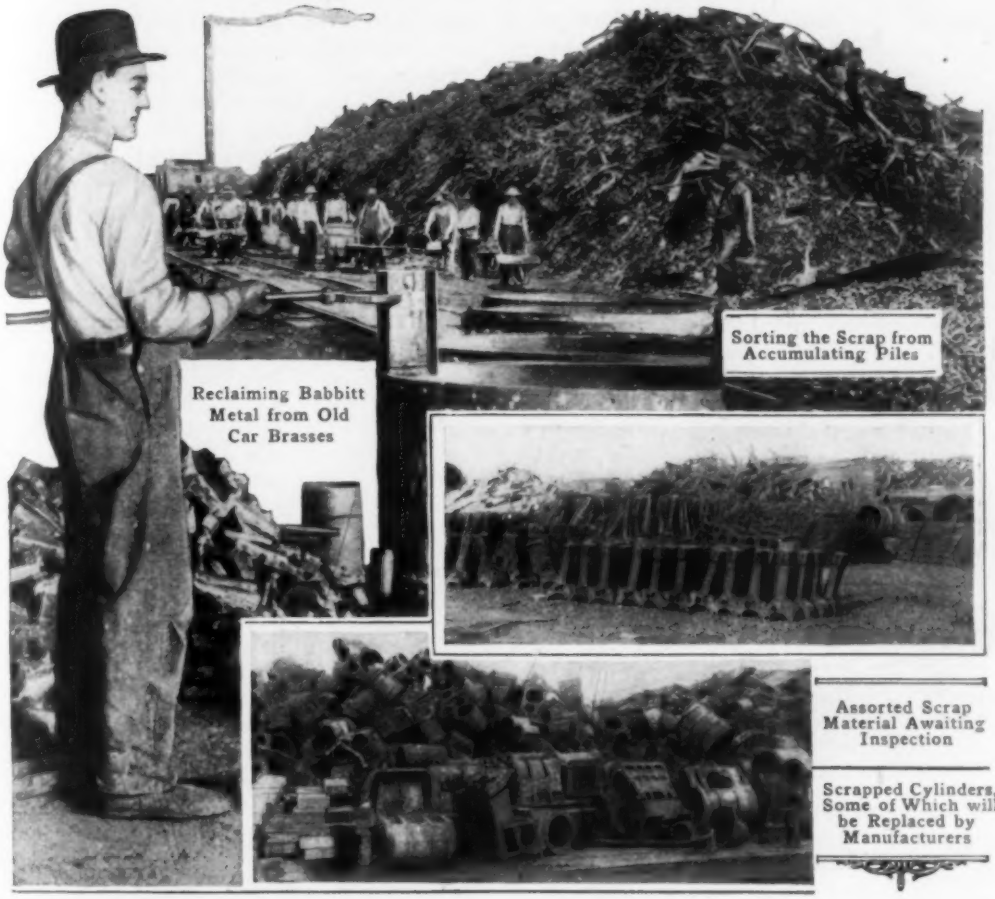
AUTOMOBILE TUBE IS USED TO TOW STREET CAR

Employment of an extraordinary test for the purpose of ascertaining the strength of a newly invented automobile inner tube, recently attracted much attention at San Diego, Cal. A single inner tube, looped over spools, was used as a towline between a steam roller and a 26,000-lb. street car, which was pulled up a 1½-per-cent grade. Before the wheels of the car began to turn the tube was stretched approximately 18 ft. In addition to pulling the weight of the car and its load of spectators, the rubber connection had to withstand the strain of turning over the electric motors. Engineers estimated that the pull equaled seven tons. Examination following the experiment showed the tire to be in perfect condition.



Inner Tube of Automobile Tire, under Strength Test, Pulls 26,000-Pound Street Car up Grade

HOW RAILROADS SAVE MILLIONS FROM SCRAP HEAP


Sorting the Scrap from Accumulating Piles
Reclaiming Babbitt Metal from Old Car Brasses
Assorted Scrap Material Awaiting Inspection
Scrapped Cylinders, Some of Which will be Replaced by Manufacturers

A few years ago the railroads began to watch the scrap heap as a possible source of revenue, too long neglected. It was found that considerable usable material could be reclaimed with little trouble and at small expense, and scrap docks or reclaiming shops were established on many roads. At first they were little more than collecting depots, but as the possibilities of the amount of material that could be reclaimed were realized, buildings were erected and machinery installed until now complete plants are in operation in almost every section of the country.

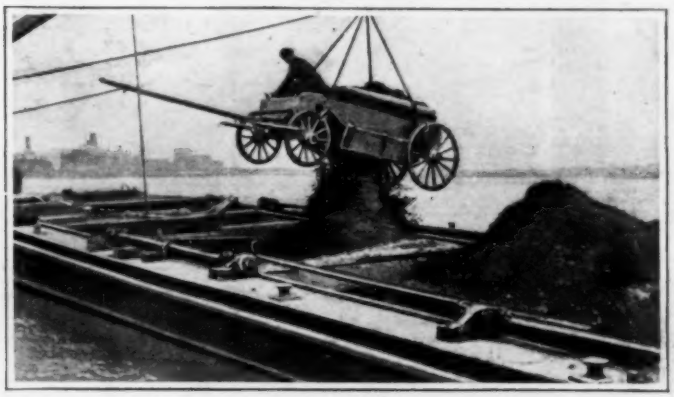
One scrap plant near Chicago handled 143,142 tons of scrap in a single year, at a cost of $50,063.67. The scrap sales amounted to approximately $1,000,000, while the value of the material reclaimed from the scrap amounted to $421,497.48; this was handled and made serviceable for only $53,766.81, which is at the rate of $12.76 per $100 reclaimed. When this remarkable return is received on the money invested, it is little wonder that the plant is regarded as a most profitable affair.

Among the important items saved during one year in this one plant were 2,307,354 bolts of various kinds and sizes; 140 tons of nuts; 1,110 kegs of spikes; 3,500 track shovels and 600 scoops; while switch stands, couplings, hose and hose fittings, couplers,

brake beams, jacks, drills, trucks and wheelbarrows, totaling well over $50,000 in value, besides 4,500 steel wheels for re-tiring and 20,000 tons of round and flat iron for rerolling, were also recovered for use. Nor is the mere reclamation of old and outworn material all there is to this campaign, for the replacement of defective material is an important feature. All material is carefully inspected before it is sold as scrap and a good deal is found to have builder's defects. These are set aside and after inspection by representatives of the concerns selling them or by manufacturers, they are replaced, and this is a big saving in the purchasing department's budget.

DUMPING DEVICE LIGHTENS TASK OF DISPOSAL

Getting rid of the earth excavated from the foundations of new buildings is a problem in the crowded city, which is usually solved by carting it to the nearest docks and loading it upon scows. The delay in rehandling the debris is eliminated when the method pictured herewith is used. A jib crane has suspended from the cable a hook, equipped with four chains of equal length, each ending in a hook. These four hooks are caught in the four wheels of the dirt wagon, the horses having been unhitched, and it is thereupon swung out and over the scow. The driver, who remains on his seat, then releases the clutch, the bottom of the dirt wagon opens and the debris is unloaded. The wagon is swung back to the dock, the horses are again hitched up and the wagon drives away. The whole operation takes but a few minutes.



A Method of Earth Disposal Which Saves Time

FIGHTING FIRE WITH DYNAMITE

What threatened to be a serious fire in a Pennsylvania coal mine was extinguished quickly when charges of dynamite were exploded in the airway, the resultant concussion blowing out the flames. The dynamite was placed in bags, about 15 lb. being used in each charge, and the bags lowered to the required level and set off with electric detonators. About 15 bags of the explosive were used. Previously, the fire had been fought with water and with chemical fire extinguishers without success.

USE TIRE-MAKING METHOD FOR RUBBER BOOTS

In an effort to manufacture rubber boots and shoes which will be as durable under heavy wear as automobile tires have proved, an Ohio company has decided to make its footwear by the unit-construction method, under high pressure. Instead of vulcanizing practically without pressure, it is proposed to weld the rubber and fabric together under such a terrific weight that the two, to all purposes, become one unit. In this way, it is claimed, leaks, cracks and peeling should be minimized almost to the same degree as in automobile tires.

CONTRACTS FOR PANAMA COLLIERS AWARDED

Contracts for the construction of two colliers, which will convey coal to the Panama Canal coaling plants, have been awarded at a cost of $987,500 each. The two vessels will be called "Achilles" and "Ulysses," in conformance with the custom of giving colliers names from Greek and Roman mythology. Each of the boats will be approximately 500 ft. in length and have a capacity for 12,000 tons of coal, besides sufficient space for bunker coal with which to make the round trip between Norfolk and Colon.

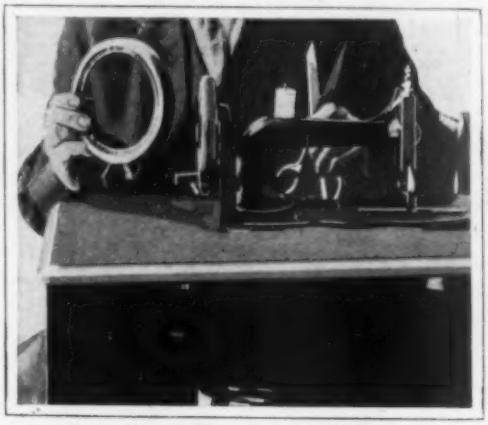
SNAPPING TURTLES MAKE NOVEL TEAM

While novel means of transportation often are seen employed in different parts of the world, probably nothing more uncommon is to be found than harnessed marine reptiles. A Wisconsin boy has the distinction of being the possessor of a team of eight snapping turtles which he hitches to a small wagon and drives around at his pleasure. Although these are more unusual, if not spectacular, than actually useful as beasts of burden, they nevertheless are capable of performing the unnatural function demanded of them. They experience no difficulty in pulling the boy and his wagon and probably could manage a heavier load if it were imposed. Domestication does not change the gait of the turtles, however. They move at their own accustomed rate, which is not exceedingly fast.

A Wisconsin Boy's Team of Snapping Turtles

SEWING-MACHINE DEVICE SHARPENS CUTLERY

A tool-sharpening attachment for sewing machines, which makes it possible to sharpen household cutlery with no more exertion than is used in sewing two pieces of cloth together, is the invention of a Pennsylvanian. The device consists of a grooved hoop, the circumference of which bears a grinding surface that fits tightly over the flywheel of the sewing machine. By a rearrangement of the bearings speed is attained. When the clutch in the wheel is thrown out, leaving it free from the rest of the machine, grinding may be done without necessarily increasing the wear.



Sewing Machine with Grinding-Hoop Attachment Which Fits over Flywheel

FLINT PEBBLES GATHERED ON FRENCH COAST

Gathering flint pebbles along the coast near Havre, France, has developed into an important local industry in recent years, and pebbles from this district are now shipped to all parts of the world for use in the manufacture of porcelain and in grinding operations. To produce the best results in manufacture the pebbles must be round and smooth.

NEW FLYTRAP ELECTROCUTES THE INSECTS

A trap which electrocutes the captured flies or other insects has been brought out by a German manufacturer, and may be had, if desired, in combination with an electric-lighting fixture. The electrical element in the trap consists of a cylindrical coil of bare wire, wound closely together, connected at the upper end with the source of electric energy by a common plug, while the lower end is not connected, so that normally no current passes. When a fly or other insect, attracted by a sweetened solution kept within a lower bowl-shaped part of the trap, alights on the wires, a circuit is established and the insect is killed. In the combined light and trap, the apparatus takes a different form, but the arrangement is the same, and the light helps to attract the flies.

SOOT DAMAGES METAL WORK IN SMOKY CITIES

The savings possible in large cities through smoke abatement are illustrated by a series of comparisons of the life of metal work at Pittsburgh as against that in smoke-free places. Acid chemicals contained in soot eat away metals. Through statistics it is shown that the life of exposed metals in the "steel city" is approximately only half what it is many places elsewhere. Galvanized sheet iron has a life of from 3 to 6 years at Pittsburgh, while at Washington it will last from 7 to 14 years. Tinned sheet iron will live from 13 to 15 years in the Pennsylvania city, and from 18 to 28 years where it is free from smoke. Copper will last only from 10 to 20 years in Pittsburgh smoke, though it is almost imperishable elsewhere. Metals protected by paint are in a somewhat less degree subjected to the same danger.

MOTION-PICTURE EXPORTS GROW RAPIDLY

Exportation of motion-picture films from this country increased materially during the month of March, when 23,000,000 ft., as compared with 3,000,000 for the same month a year previously, were shipped abroad. With these enormous sales there was a decided decrease in price quotations under those of the corresponding month in 1912. At that time, the average export price, based on wholesale figures at domestic points of shipment, on exposed films, was slightly less than 10 cents a linear foot. In the recent exports the price was little more than 3½ cents. Unexposed-film prices dropped from 12 to 3 cents.

NEW STYLE OF WRENCH IS SELF-ADJUSTING

A new self-adjustable pipe wrench has a rivetless and pinless pivotal point. It has but three working parts, so arranged that the wrench may be placed in a gripping position and operated by one hand. There are no bolts or nuts to cause trouble by jamming when work is being done in close places. Concealed springs which make the wrench nonlocking are not under pressure while there is a strain on the tool.

New Self-Adjusting Pipe Wrench

COURTESY OF THE CAR
This Glider, Equipped with Aerial Propeller and Built Like a Flying Boat, Took a Prominent Part in the Recent Motorboat Races at Monaco

GLIDER IS LIKE MONOPLANE WITHOUT WINGS

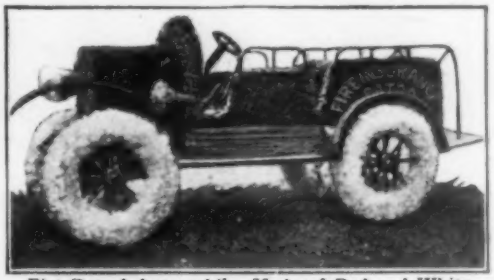
Of the many curious kinds of craft that took part in the motorboat races at Monaco in April, 1914, there was none that attracted more attention on account of the novelty of its construction than the French glider "Glisseur Fabré." This machine has the body and pontoons of a flying boat, but not the wings. Power is applied through an aerial propeller at the front, and apparently all that would be needed to transform it into a monoplane is two wings and steering and balancing apparatus.

AMERICA IMPORTANT MARKET FOR JAPANESE GOLDFISH

In Japan, the raising of goldfish, which form a familiar feature in the gardens, parks, temple grounds and homes, is an important industry, enormous numbers being raised not only for the home markets but for export to foreign countries. It is estimated that more than 100,000 goldfish are annually exported to the United States from Yokohama alone. The average life of the Japanese goldfish is about seven years, and when taken from the farms for shipment they are usually about two years old. The greatest care is taken in shipping them, and even then a large percentage usually die before a shipment reaches the American markets.

FLORAL FIRE PATROL AS FUNERAL EMBLEM

A fire-patrol automobile made of red and white carnations covering a light wooden frame was the appropriate emblem placed on the grave of a veteran fire-insurance agent by his colleagues. The emblem was carried on a motor truck and formed the most conspicuous feature in the procession from the home of the deceased to the cemetery.



Fire-Patrol Automobile, Made of Red and White Carnations, Placed on Grave of Veteran Fire-Insurance Agent

ODD AND STRIKING CONTRASTS IN FOOTWEAR

Street Market in One of the Principal Thoroughfares of Pekin: In Stalls Like This, Established in the Middle of the Street, the Chinese Buy Their Curious Shoes as Well as Many Other Articles of Clothing

These Awkward-Looking Sandals are Much Worn by the Poorer Classes of Japan; Each Sandal is Held in Place by a Strap That Passes between the First and Second Toes

The Footwear of Italian Peasant Boys Is Often Nothing More Than White Cloth Deftly Wound about the Foot and Tied with Cords. These Boys Live in a Suburb of Rome

PHOTOS COPYRIGHTED BY UNDERWOOD & UNDERWOOD

ODD AND STRIKING CONTRASTS IN FOOTWEAR

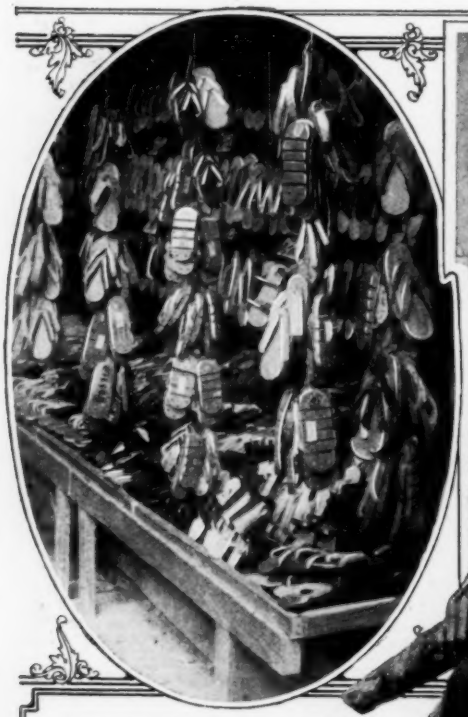
The "Twinkling Toes" of a Famous Ballet Dancer: This Position, Indispensable in Ballet Dancing, would Be an Impossible One without the Padded Toes

Members of Queen's Guard in Athens, Greece, Wear Shoes Made of Red Leather, Ornamented with Gorgeous Pompons That Emphasize the Effect of the Upturned Toes

This Curious Stilted Sandal, Worn by the Upper-Class Swahili Girls of Zanzibar, Is as Costly as It Is Elaborate; It is Made Largely of Silver and Has a Jeweled Knob That Fits between the Toes to Hold It in Place. The Doll-Shaped Object Shown in the Picture Is a Native Fetish Supposed to Drive Away Devils and Guard the Possessor's Happiness

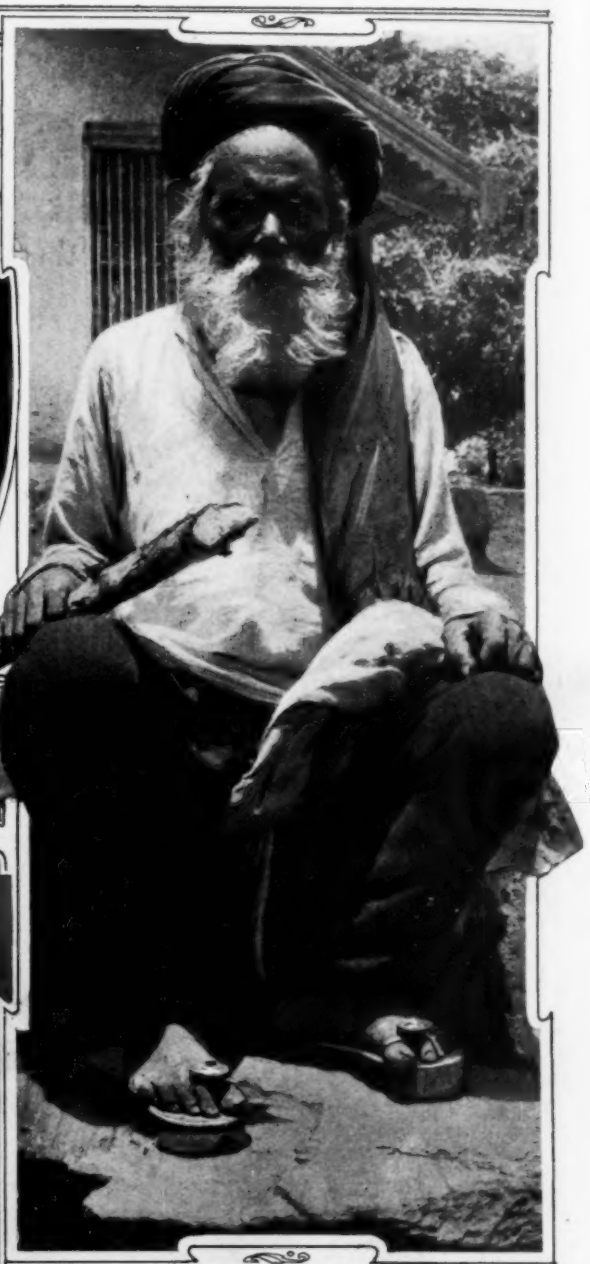
PHOTOS COPYRIGHTED BY UNDERWOOD & UNDERWOOD.

ODD AND STRIKING CONTRASTS IN FOOTWEAR



Japanese Bargain Sale of Straw Sandals: These Sandals are Loosely Held to the Foot by a Padded Strap Passing between the Toes and are Easily Removed, in Accordance with Japanese Custom, When Entering a Temple, Shop or Dwelling

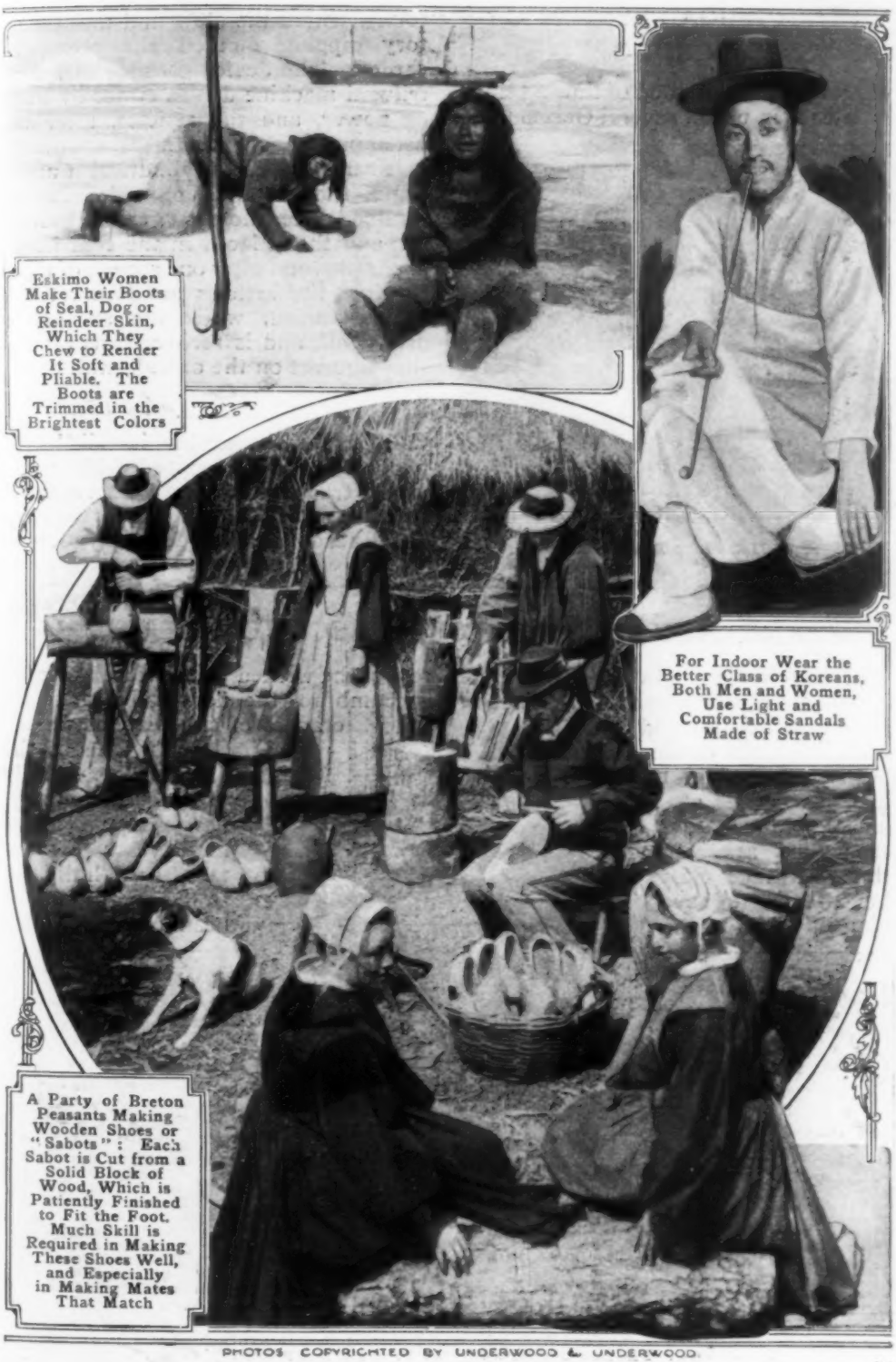
The Craze for Tango Dancing is Responsible for This Extreme in Footwear. The Ostrich Feathers That Ornament These Slippers are Striking Enough to Attract Attention Anywhere, and may be Intended to Suggest the Fleetness of Mercury



Wooden Sandals Worn by the Poorer Classes of India: This is Probably the Oldest and Simplest Type of Footwear in the World and has Doubtless been Worn by the People of India for Ages. The Sandal Consists Only of a Flat Wooden Block Roughly Hewn to Shape and Equipped with a Knob That Slips between the First and Second Toes and Holds It to the Foot

PHOTOS COPYRIGHTED BY UNDERWOOD & UNDERWOOD.

ODD AND STRIKING CONTRASTS IN FOOTWEAR



Eskimo Women Make Their Boots of Seal, Dog or Reindeer Skin, Which They Chew to Render It Soft and Pliable. The Boots are Trimmed in the Brightest Colors

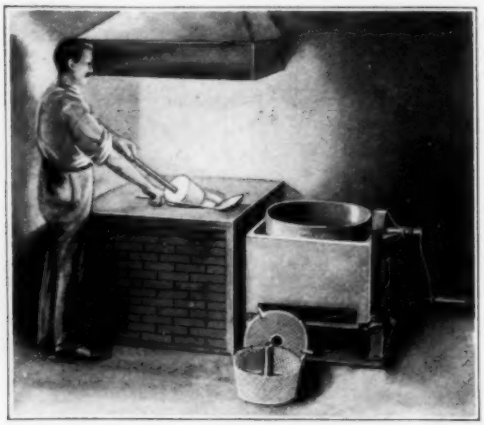
For Indoor Wear the Better Class of Koreans, Both Men and Women, Use Light and Comfortable Sandals Made of Straw

A Party of Breton Peasants Making Wooden Shoes or "Sabots": Each Sabot is Cut from a Solid Block of Wood, Which is Patiently Finished to Fit the Foot. Much Skill is Required in Making These Shoes Well, and Especially in Making Mates That Match

PHOTOS COPYRIGHTED BY UNDERWOOD & UNDERWOOD

CENTRIFUGAL SYSTEM OF TINNING

An improved method of tinning small articles is in use in several German factories, where the slow and unsatisfactory dipping method has been discarded. The device consists of a centrifugal machine driven either by hand or power, and the articles, after the usual preliminary treatment, are placed in quantities in a cylindrical tinning drum, the side wall of which is perforated. The whole is dipped in molten tin, and then placed in the centrifugal apparatus, and after one second of rapid turning, the articles are found to be evenly tinned, while the surplus is driven off, and is recovered as a ring-shaped crust on the outside wall of the drum.



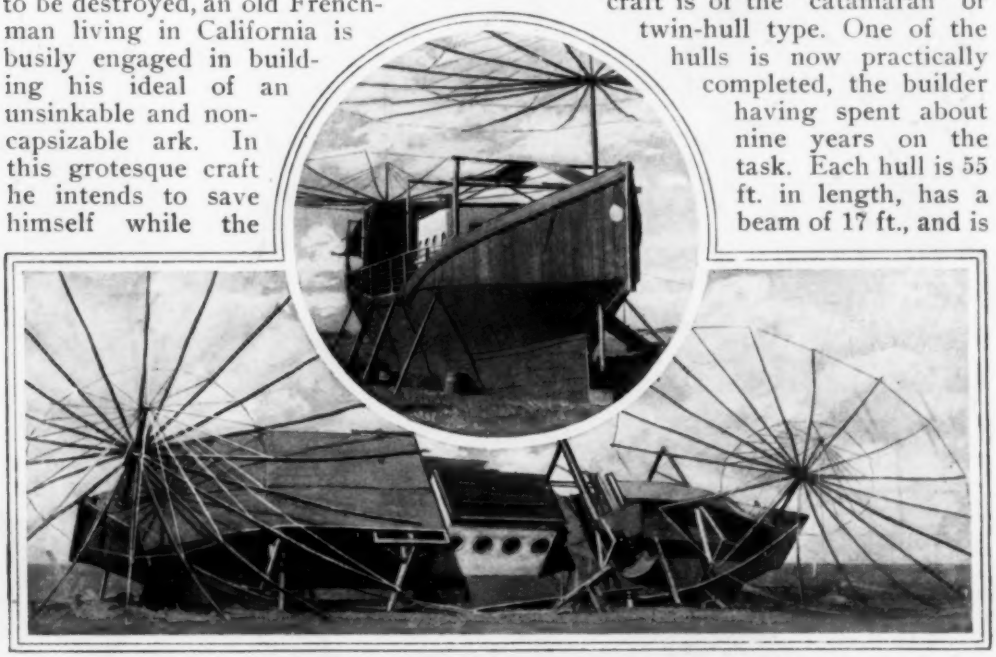
COURTESY DIE EXPORT WOCHE

Rapid Method for Tinning Articles

¶A London theater has installed telephones that are equipped with megaphone transmitters and with receivers that are attached to the head with the usual headbands, for deaf playgoers.

ARK BUILDER FORESEES SECOND DELUGE

In anticipation of a second deluge, by which he believes the world is soon to be destroyed, an old Frenchman living in California is busily engaged in building his ideal of an unsinkable and non-capsizable ark. In this grotesque craft he intends to save himself while the rest of the wicked world, if it likes, may succumb to the flood. This curious craft is of the "catamaran" or twin-hull type. One of the hulls is now practically completed, the builder having spent about nine years on the task. Each hull is 55 ft. in length, has a beam of 17 ft., and is



Top View: Completed Half of the Twin-Hull Ark, Which is being Built in Anticipation of a Second Deluge.
Lower View: The Ark Overturned by the Tide, but Not Materially Damaged

estimated to draw 6 ft. of water. The keel amidships is a solid core of wood, 4 ft. deep and 6 ft. across, tapering from these dimensions toward the bow and stern. This massive keel is designed to prevent disaster on the rocks. The motor power is to be two enormous windmills, one at the bow and one at the stern, each geared to a propeller. The builder claims that his only friends are his chickens and his goat, and these are to comprise the passenger list. His plans are entirely different from those of Noah, as he does not intend to take along two of each species of the animal kingdom.

CURIOUS TEAM HAULS HEAVY LOAD

When the Chinese desired to reclaim part of the extensive burial grounds that surround the city of Mukden, they employed a novel team to haul the dirt wagon. Two horses, two bulls, and a donkey were hitched together

A Heavy Team for a Heavy Cart

and pulled the rude cart used in transporting the dirt. The cart wheels had no spokes, but only rough wooden beams, and on the framework of the cart a coffin-shaped basket held the earth.

TUNNEL PROVIDES DIRECT ROUTE FOR HIGHWAY

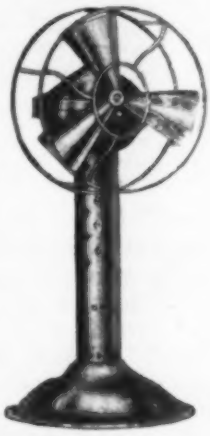
By the construction of a short tunnel that burrows through a narrow rock ridge, near Winterset, Iowa, a highway that formerly followed an indirect route through the hills has been straightened and shortened about four miles. This tunnel was dug originally for conveying water used for

The Highway is Shortened About Four Miles by This Short Tunnel through a Rock Ridge

power purposes, and was later enlarged to the dimensions required for letting the highway through.

FAN OPERATES WITHOUT USE OF ELECTRICITY

Working without electricity or springs, a fan has been constructed for home and office use which produces a pleasant, cool breeze, without noise and at an operating cost of one-half cent an hour. Motive power is generated by the rapid expansion of hot air. Each stroke of a small piston forces air into a cylinder where by the heat of an alcohol flame it is expanded, developing sufficient force to drive the fan blades with speed. The stand is slightly less than 1½ ft. high and weighs 8 lb. It can be moved from one position to another without trouble, and the fan, it is claimed, will run without need of repairs or danger of getting out of order.



SANITARY DRINKING FOUNT IS MADE FOR HORSES

Attempt to prevent the spread of glanders has resulted in the construction of a sanitary drinking fountain for horses. The new-style watering place was made especially for the city of Boston, where the disease was reported to be causing horsemen much concern. In the building of the fountain, large cups, capable of holding a bucketful of water, are placed in the basin. In order to prevent their use during danger periods, covers are made to fit over them. Bucket stands are stationed about the base of the structure. When it is deemed unwise to allow animals to drink from the common trough, the owners are expected to carry individual pails for their horses. These may be filled, when placed on the stands provided for them, by pressure on the valves in the faucets extending from each cup.

By the Use of Individual Buckets during the Prevalence of Glanders, Veterinary Authorities Expect to Stop the Spread of the Disease

BRICK MADE FROM SAND AND CEMENT

A process for making building brick of sand and cement only has been developed, and brick of this kind are being placed on the market. Any kind of clean sand may be used. The secret of the process lies in the use of a cement which is mixed with the sand and which is made from glass sand by a process of melting, cooling, pulverizing, and treatment in a digester. About 35 gal. of this cement is sufficient for making a thousand brick when mixed with ordinary river sand, sea sand or bank sand, and the sand may be either wet or dry. After being mixed, the material is formed into brick in presses and is then dried under a temperature of 500°F. One of the advantages of the process is that the brick may be made complete within a period of 12 hours. Various colors may be obtained by adding oxides and mineral coloring to the material when mixing. Tests on brick made by this process show an average compressive strength of 6,000 lb. to the square inch.

CLAMSHELL BUCKET DIGS CRANBERRY MARSH

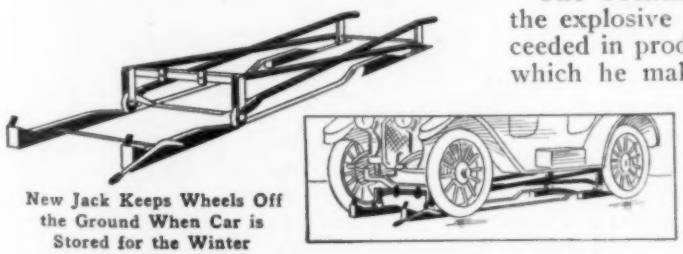
In Wisconsin there is a clamshell-bucket dredge in use which at each shovelful removes an amount of material much greater than the size of the bucket itself. The reason is that the outfit is being used to dig a channel through a cranberry marsh, where the material to be cleared away varies all the way from tangled weeds to hardpan. The eventual object of this channel, which is 30 ft. wide and 6 ft. deep, is to drain 1,500 acres of cranberry land. In one section of this land there is a lake, the waters of which must be distributed throughout the bogs during certain seasons of the year. The use of this type of bucket, which, besides digging into hard ground, will also come away with bushels of underbrush, matted boughs, etc., hanging from its jaws, illustrates the art of adapting the tool to the work.

NEW KIND OF METAL BOTH LIGHT AND STRONG

Ormiston metal, a new aluminum alloy, has been invented by an Australian, and under exhaustive tests has demonstrated both lightness and strength comparable with copper and steel. It is claimed that the new metal is as hard as steel and that it may be brazed and soldered, although as yet welding appears to be impossible. It has a far higher tensile strength than aluminum, but is practically of the same weight and not corrosive. The electrical conductivity is half that of pure copper, and it withstands oxidation when exposed for long periods to the effect of sea air. It is being used for cans for meats and other foods, as well as for marine furnishings.

AUTOMOBILE JACK RAISES FOUR WHEELS AT ONCE

A steel jack, adjustable for various makes of cars, has been offered the automobile trade, which is designed to lift all four wheels from the floor simultaneously. The momentum of the car carries it onto the jack, which automatically raises the car clear of the floor 1½ in., permitting wheels to be taken off, tires examined or removed, and keeps the pressure off the tires when the car is not in use. It is also valuable from the fact that tires are thus kept out of the oil and grease so often found on garage floors. While thus raised, the engine may be tested without danger of the car being jarred to the floor. The jack is so arranged that any length of wheel base may be taken care of by simple adjustments.



New Jack Keeps Wheels Off the Ground When Car is Stored for the Winter

EMERGENCY UNHITCHING DEVICE

When a barn catches fire the matter of saving the horses and mules is a most serious problem. Rapidity of the blaze, the panic of the animals and the confusion make the release difficult, sometimes impossible. A device has been installed in the barn at a colliery in Pennsylvania which was the means of saving the lives of 43 mules in a recent fire. A wrought-iron gas pipe, 1¾ in. in diameter, was passed through all the stalls, from one end of the barn to the other and supported on the fronts of the stalls. In each stall a ⅞-in. rod passes through the pipe, its lower end being bent to a hook with the point resting in a slight depression in the manger. The halter-strap ring is hooked over this. A quarter turn of a handle at either end of the pipe turns the hooks back and the rings drop off, releasing all the animals in the barn simultaneously.

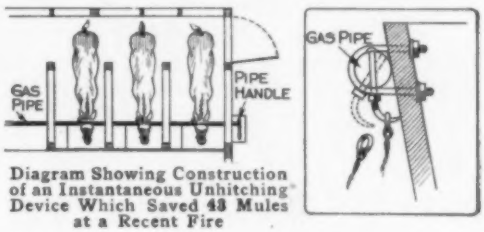


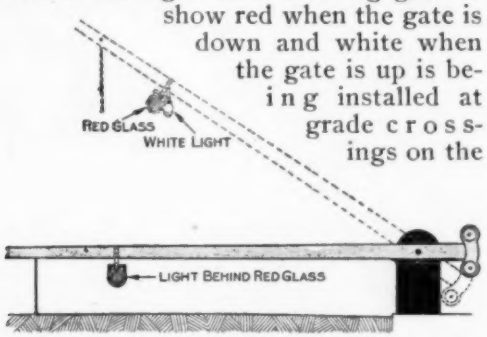
Diagram Showing Construction of an Instantaneous Unhitching Device Which Saved 43 Mules at a Recent Fire

NEW FRENCH GUNPOWDER SAFER THAN OLD

The French chemist who invented the explosive "melinite" has now succeeded in producing a new powder for which he makes the claim that it is proof against self-ignition. Disastrous accidents have repeatedly been caused in the arsenals of France, both army and navy, by the explosion of quantities of powder stored therein, which had suffered such chemical deterioration as made it highly unsafe to handle.

CROSSING LIGHT CHANGES COLOR AUTOMATICALLY

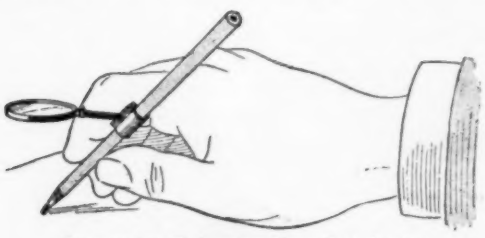
An exceedingly simple device that causes the light on a crossing gate to show red when the gate is down and white when the gate is up is being installed at grade crossings on the Lehigh Valley Railroad. This device consists simply of a red bull's-eye which is fixed to the gate in such a way that the red glass is immediately in front of the point where the lantern hangs when the gate is down. As the gate comes down, the lantern, which has been showing white, swings behind the bull's-eye and shows red. As the gate is raised, it swings from behind the bull's-eye and shows white. Since the lanterns are all white there is never any danger of confusing the engineer of the train by red lights.



The Light Shows White When Crossing Gate is Up, But as the Gate is Lowered the Lantern Swings behind the Red Glass and Shows Red

SUPPORT FOR ENLARGING GLASS

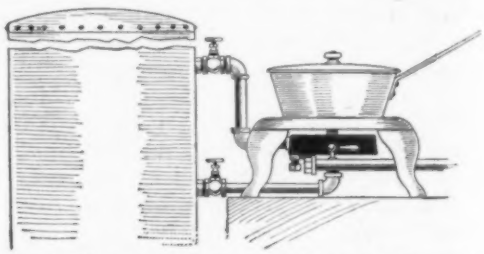
An English firm has placed on the market a device for the convenience of draftsmen by which a magnifying glass is attached to the pen or pencil, or to an engraving tool. The device fits on the handle of the instrument, and when it is adjusted to the exact position required by the operator's eye, need not be changed. For mapping, drafting, etching, engraving, or even in surgery, the lens, which is of high power, may be instantly available at the moment desired, without any alteration or adjustment.



Interesting Enlarging-Glass Attachment

A NEW GAS BURNER HEATS WATER AT LOW COST

A late patent covers a combined gas burner and water heater so arranged that the burner may be used in the customary manner while at the same time water in a tank or reservoir will be heated without additional cost. The heater consists of corrugated rings with upper and lower sections, distinct although cast in one piece. Through the upper compartment water flows continuously from the supply to the tank. The lower compartment is connected with the gas supply, and the gas is brought to the lower edges of the corrugations by small pipes leading through the water compartment, burning at the orifice as in the common type of gas stove. The flame extends above the corrugations, the top of the flame heating whatever vessel may be placed on the burner, while the heat from the side of the flame is conducted into the corrugations, heating the water inclosed therein without additional cost.



Gas Appliance Which Heats the Water in a Reservoir While Range is Used in Ordinary Cooking

¶To prevent any thought of time from interfering with the enjoyment of visitors, the use of clocks displayed architecturally has been forbidden at the Panama-Pacific Exposition.

HUNTING NEW FIBERS FOR PAPER MAKING

Experts in the U. S. Department of Agriculture have been making exhaustive tests with various crop plants to determine their availability for paper making, with the result that excellent paper has been made from crop wastes and by-products from corn, broom corn, rice and cotton. The department has published a circular on "Crop Plants for Paper Making" which is printed upon separate sheets of paper made from these substances. In addition to the fibers mentioned, other materials were utilized with more or less success, including sorghum, flax, jute, okra, and certain grasses, rushes, sedges, canes and weeds, as well as straw from common grains. While many of these are available for use, the enormous quantities which must be gathered in order to bring a commercial value to the product, practically confines the crop wastes to the four first mentioned, which may be obtained in almost unlimited quantities within a territorial range suitable for manufacturing purposes.

HOW CHINESE LOOKS IN ROMAN LETTERS

In some portions of China the ideographic or picture writing that has been in vogue in that country for ages is being gradually supplanted by the Roman alphabet, with a result that strikes the occidental eye as being curious in the extreme. The accompanying extract is taken from a paper printed in the Romanized Hsinghua dialect, and consists of an announcement of the Panama-Pacific Exposition at San Francisco. Expressing all the sounds of this dialect with only 26 letters seems to have been a difficult undertaking, judging from the number of accent marks and other qualifying marks that have been used. The adoption of the Roman alphabet by the Chinese will mean a big saving in the time required for learning to read and write the language, a process that now requires years of study, but it will also bring about some confusion. A great many dialects widely different from each other are spoken in China, but,

Gōi-gọh.

Ba-ná-mâ eó siáⁿ-ciū, Gi-niāng duā sẹ̄-hōi dā-1 geò tọng-gọ̀ ē cụ.

(Họh-ciu Bî-gọh Niâ-seō Hah Leh, ū dèh-dèh giọ̀ seòh dạuⁿ Ba-ná-mâ eó sẹ̄ - hōi ē tọng-gọ̀ keoh bôiⁿ beò-guâng. Da ciọng cā̤ tọng-gọ̀ keh chōi keoh gọh-náng kuáⁿ.)

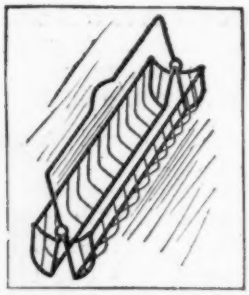
Ba-ná-mâ eó lẹ̄ siáⁿ-ciū gi-niāng duā sẹ̄ hōi, diāⁿ leòh Cụ âu 1915 níng, dī-gòih 20 heō kî, (Bái-6) cāi Bî-gọh Ga lī heòh-ní-á sêng Sang-puang-chī dā-họng kai-hōi, gâu 12-gòih 4 heô cî; gēng-cọng ū gâu gòih buáⁿ. Cā̤ sī Māng gọh duā sẹ̄-hōi, Bî-gọh dậu-déng duā cheoh-lih bó-dī ih-cheh, deo ūg-gọ̀ⁿ heoh-liọ̀h.

Cā̤ seòh hói duā sẹ̄-hōi, sī cēng gū-níng (1911 níng) ciaⁿ-gòih 31 heō, iú Bî-gọh ging-siáⁿ siọng-hā nūg īng, cā̤ pā-suáⁿ hōi-dậuⁿ seh-lih leòh Ga-lī-heòh-ní-á séng. Cā̤ sẹ̄-hōi leòh gọh-gọh ē siọng-bū ū duā guang-hā̤; cā̤ seō-lā̤ duā ậu-gîng, gó-cheô leòh ging-níng 10-gòih 14 dih, dèh-dèh chiâⁿ Bî-gọh Dāi-cọng tọng Ui-cî-seóng, ching-sing gâu hōi-dậuⁿ lē, héng hẹ̄ng gēng-dọh hōi-dậuʳ ē lā̤; hṳ̄ sí-cā̤ gọh gài hù-hōi ē gēng ū nūg-chaⁿ guā náng. Cṳ̄ 1912 níng, 2-gòih chọ̄ 2 dih, Dāi-cọng-tọng Ui-cî-seóng cáu-hōi sẹ̄-gài gọh-gọh, ṳ̄-bī lí sẹ̄-hōi. Hēng-sí ûng-sing lí sẹ̄-hōi ē gēng ū 27 gọh. (Bō Lậu)

Announcement of Panama-Pacific Exposition in Romanized Hsinghua Dialect, Which is Displacing the Ancient Ideographic Writing

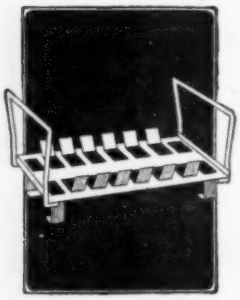
since the written symbols stand for ideas and not for words or sounds, the written language is a universal means of communication understood by all. With the adoption of the Roman alphabet with its phonetic basis, this advantage will be lost, but this loss will doubtless be more than compensated for by the increased ease with which the printed language may be learned and used.

NOVEL AND PRACTICAL THINGS FOR THE HOME



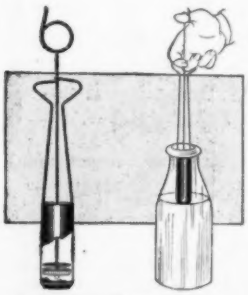
Holder Preserves Shape of Fish While Cooking

After fish have been boiled thoroughly it often is difficult to remove them from a cooking utensil without their breaking into pieces. To prevent this, a new device has been offered in the form of a wire fish basket which eliminates the trouble and preserves the shape of the fish. The fish is placed in this, and when the cooking is completed the basket is removed and the fish allowed to drop through the bottom onto a platter.



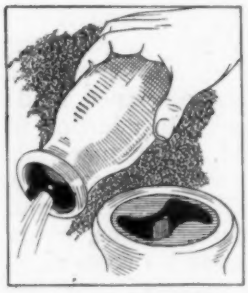
Rack for Holding Fowls during Roasting

Roasting racks for fowls, made in the form of a gridiron, have been found convenient. The rack is made to fit any ordinary roasting pan and occupies little space, giving adequate room for ample basting. Strips of the metal, which covered the holes cut in the sheet, are bent in different positions to form supports.



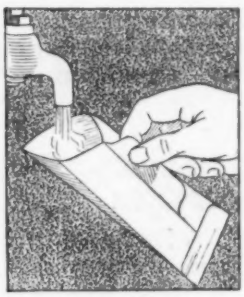
Separator Draws Cream from Milk Bottle

With the almost universal use of bottles as milk containers, by dairymen, the skimming of cream has become an added problem in the average household. A simple solution of this has been afforded by a small separator made for kitchen use. The instrument is in the form of a tube and is supplied with a valve at the bottom, which is opened and closed by means of a connecting wire. As the tube is inserted into a milk bottle the thumb is raised to open the valve, allowing the cream to enter.



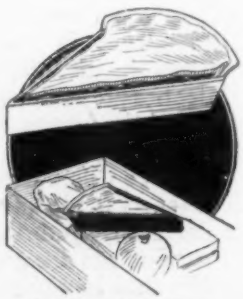
Bottle Cap Protects Milk from Dirt

In order to keep milk bottles, while in use, free from dirt and flies, a sanitary milk-bottle cap has been placed on the market. This is arranged so that by moving the stop, milk may be poured without difficulty. When closed, the milk is kept almost air-tight.



Drinking Cup Opens by Water Pressure

A paper drinking cup which opens of its own accord when water is poured into it, lately has come into use. During the process of filling it is held by a paper strip fastened at the back. When water falls upon it the cup opens.

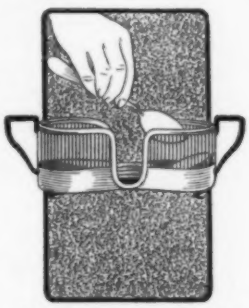


Individual Pie Tray for Lunch

With automobile tours and fishing trips, the day of the lunch box is as much in evidence now as ever. But how to carry one or two pieces of pie, still of-

fers a question to many. For this purpose a triangular tray has been invented, which holds one cut of pie in proper shape and prevents the loss of juice through leakage. The carrier occupies little room in the lunch box, and protects the rest of the contents.

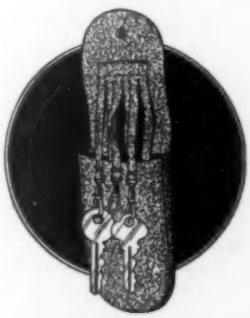
An attractive and serviceable spoon holder for table and buffet uses is being shown. The article is made in a double-basket shape with an opening in the middle which makes the removal of a spoon a simple process. The surface is silver-plated. There is room for 12 or 14 spoons.



Attractive Spoon Holder for the Table

The head nurse of a German hospital is the originator of a hygienic pocketbook, designed for ladies' handkerchiefs. The idea is simply a washable lining fastened within the pocketbook, which may be removed and washed each time a fresh handkerchief is inserted.

Hygienic Handkerchief Carrier



Neat Leather Case for Keys

A pocket leather key case, intended as a neat substitute for the common key ring, was placed on display recently. The keys are secured by snap clasps and held in a small compartment. The case is fastened by a clasp and folds into compact size so that it may be carried easily in the pocket.

Difficulty usually encountered in attempting to thoroughly clean a hairbrush, and yet not harm its bristles, or the mountings, is largely overcome by a new brush which is fitted with a removable back. The brush may be taken apart, allowing the bristles to be placed under a stream of water and quickly freed from dirt.

Two-Part Hairbrush Quickly Cleaned

A compact combination wardrobe and triple pier glass, now being marketed in France, bears the exterior appearance of a mirror frame and the interior arrangement of the customary clothespress. The inner door consists of two leaves, both mirrors. The other door, fitted with a panel glass, is pivoted to the sash so that it may be turned to any desired position. The interior of the wardrobe is equipped with a shelf and clothes forms.

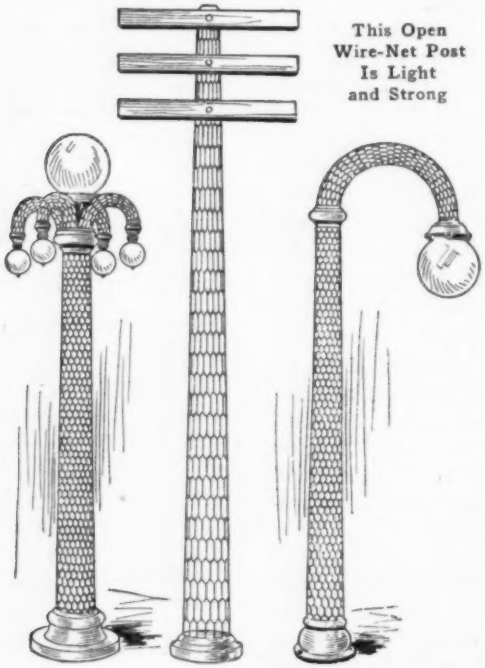
Combination Wardrobe and Triple Mirrors

Two-pronged hatpins have been introduced in Paris. The chief advantage of the new pin lies in its strong spring effect, which holds the hat solidly in place. The prongs are short, eliminating the danger of their forerunner, the long-pronged pin. Near the head of the instrument is a V-shaped curvature which prevents it moving from its place while in use.

Two-Pronged Hatpins New in Paris

ORNAMENTAL LAMP-POSTS MADE OF WIRE

Using woven wire in cylindrical form for lamp-posts, telegraph and telephone posts and supports for balustrade or newel-post lamps, a Chicago inventor has constructed a strong and ornamental support which, if bent or twisted by accident, may be pulled back into shape. Telephone posts made after this design, being of open wire-net work, offer much less resistance to the wind, and are far less liable to destruction by fire.



This Open Wire-Net Post Is Light and Strong

STRANGE ACCIDENT DUE TO A CARELESS WELD

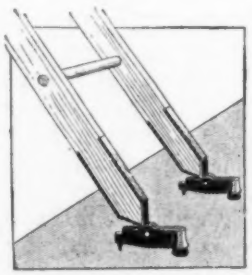
Because a 1-in. rod was hurriedly and imperfectly welded into a ring which formed a part of a guy used on a heavy telephone circuit of Portland, Ore., recently, the sleep of a quiet residence section was rudely broken when 20 big poles crashed to the street, carrying with them 600 wires. The heavy load, under the stress of a stiff breeze, proved too much for the faulty weld, which opened, allowing all the weight to fall upon one of the poles. It fell with a crash and 19 others followed in quick succession. The damage done was estimated at over $1,000, and the telephone service was deranged for 24 hours.

REFRIGERATOR ICE WAGONS IN PORTO RICO

On account of the extreme heat, ice dealers in Porto Rico find it necessary to use insulated trucks in delivering ice to their customers, and an efficient type of electric insulated truck has been worked out to meet this condition. The body of the truck has double walls and in the space between these is placed cork board. In the floor construction the material used, beginning at the bottom, is first a layer of ¾-in. Georgia-pine planking, over which cork board 1 in. thick is laid. Over this is placed 1¼ in. of asphalt, and the floor is then surfaced with 1-in. oak planking. Special refrigerator doors are used and the interior is equipped with crossbars to prevent the ice from shifting while in transit. The truck has a capacity of about 3½ tons.

SAFETY FEET KEEP LADDER FROM SLIPPING

A combination of sharp-pointed spikes and a rubber pad, which will hold equally well on wooden floors and on stone or concrete, has been invented for use on ladders. A casting, hinged on each ladder foot, is provided with a threaded horseshoe spike at one end, and a large-sized crutch tip of soft rubber at the other. The spike will hold on wood or dirt surfaces, while the rubber pad will keep the ladder from slipping on surfaces where the spike would slide.

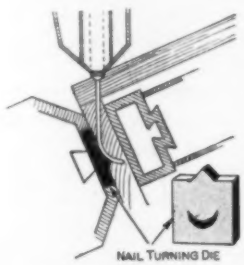


ODD PROTECTION AGAINST SAFE BLOWERS

A St. Louis inventor offers a new safeguard against the activities of thieves who specialize in blowing safes. It consists of a chemical mixture contained in a bottle designed to be hung between the outer and inner doors of a safe. Protected against ordinary shocks, such as opening and closing the doors, by two layers of felt, it explodes when violently broken, sending out such reeking fumes as all but smother the intruder, at the same time half blinding him. The bottle is hung just behind the combination, and in such a position that the burglar's drill must break it, if the combination is attacked. The device has been placed on the market recently.

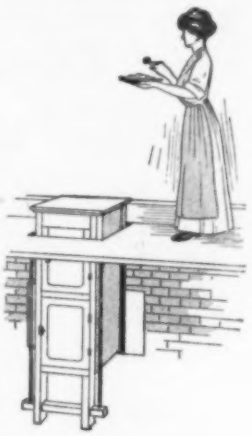
A NEW BOX-MAKING MACHINE CLINCHES THE NAILS

A new method of nailing up many classes of boxes and cases has been patented by an English concern, which not only drives the nails quickly, but turns the ends back in hook form, locking the ends and sides securely. The machine by which this is effected is an improved form of vise nailer. Turning dies are attached to the back jaw of the vise, and when the nails are driven, the pointed ends which penetrate clear through the board strike against these turning dies and are forced back into the wood in such direction and shape as may best serve the purpose. In this device the nails are driven at an angle across the intersection of the two boards to be joined, in this way getting a larger grip on the face of the boards, and reducing greatly the danger of splitting them. This method makes it practically impossible to withdraw the nails without destroying the timber or box.



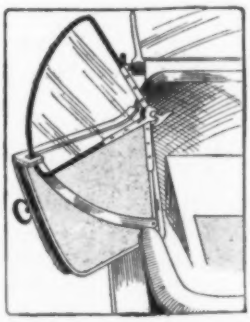
AUTOMATIC DUMB-WAITER SAVES MANY STEPS

A convenient dumb-waiter which may be installed in any home where the kitchen is over the cellar, has just been patented. The top lies flush with the floor. A press of a button, or a pull of a lever, and the dumb-waiter rises from the cellar right up into the kitchen. It is perfectly ventilated, finished within and without in white enamel, all the openings are screened, and it has several compartments. A slight shove returns the waiter to the cellar without bump or jar. It saves climbing stairs and yet occupies no space in the kitchen.



SIDE SCREENS KEEP WINDS FROM AUTOMOBILIST

Side windshields, which fasten to the doors of an automobile, are the latest novelty shown in English shops. They are of celluloid in brass frames, and swing up in place when desired, or close down out of the way when not needed. Being fastened to the doors and opening with them, they offer no obstruction in entering or leaving the car.



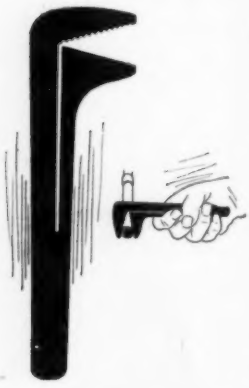
¶ The addition of one-half of 1 per cent of lead to a bronze mixture preserves the strength of the material up to 500 degrees of heat.

GARBAGE CAN DISINFECTS ITSELF

With the advent of the heated term, a new device, just patented, offers to solve, in a practical way, the problem of the garbage can. The receptacle is outwardly in no way different from the ordinary garbage can, but the cover, which fits tightly over the receptacle, is filled with a disinfecting powder, a little of which shakes down upon the garbage through small perforations in the bottom of the cover whenever it is disturbed. The replacing of the cover on the receptacle after depositing garbage therein is sufficient to distribute enough disinfectant to keep the can sanitary and drive away ants, bugs and flies.

NEW KIND OF WRENCH ALL IN ONE PIECE

A one-piece wrench which is designed to do all that any Stillson, monkey or alligator wrench will do has been patented, which contains a new feature. A slot running lengthwise of the handle partly separates the two jaws. When applied to a nut or bolt, the spring of the wrench throws the article to be turned firmly against the teeth of the upper jaw, and holds it without slipping. Any size bolt or nut, from ⅛ in. to 1½ in., may be gripped.

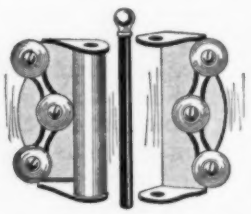


FIVE-MILE RAILROAD PAYS GOOD DIVIDENDS

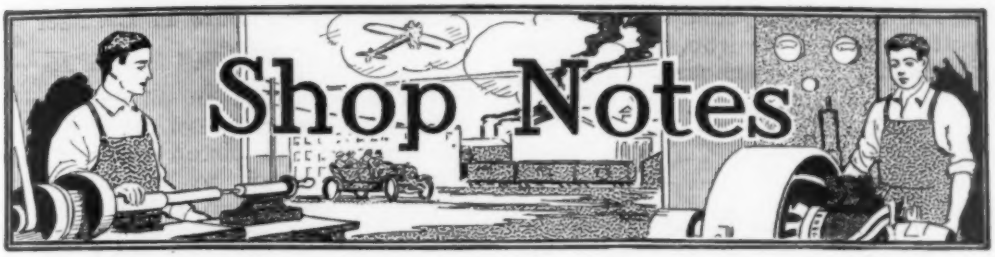
One of the shortest railroads in the United States, which has paid four-per-cent dividends since it first began to operate, extends from Waterville to Douglas Junction, Wash., a distance of five miles. When the Great Northern Railway was pushed through the country it left the little town of Waterville off its map. The disappointed settlers determined to own and run their own railroad, which should connect with the Great Northern at Douglas Junction. The road now is in its fourth year of operation. No bonds have been issued, it has no outstanding debts and it never has had an accident, injured a passenger, nor encountered a lawsuit.

DETACHABLE SPRING HINGE FOR SCREEN DOORS

By simply pulling out the pin a new spring hinge for screen doors may be detached without danger of losing the spring, and as easily put together again. The novel contrivance consists of two flanges of wrought iron, with embossed ribs and screw holes. The spring is incased within a cylindrical chamber on one side, and does not fall out when the hinge is taken apart. The hinge, once being securely fastened on the screen door and jamb, need not be unscrewed when the time comes to take down the screens, for by removing the pin the hinge separates, the door coming out, and the pin, replaced in the flange remaining on the door, is safe until next spring.



¶Artificial light in foundries should have a yellow cast. Yellow rays penetrate smoke and fumes and dust better than others, and the powerful yellow-flaming arc light has been found to be adapted to every requirement.

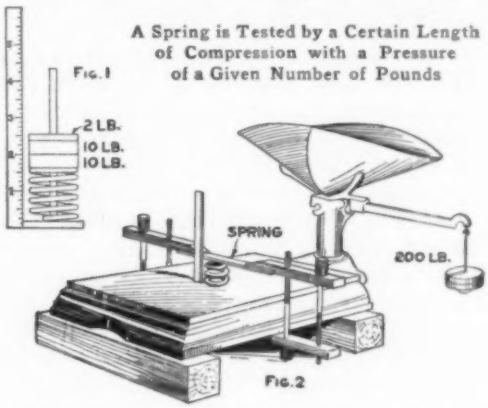


Testing Helical Springs

Two very simple, yet accurate, methods of testing helical springs are illustrated, which should be of great value to a garage owner or automobile repairman, where the accurate testing of a valve spring, for instance, is of vital importance. The testing of a spring consists of measuring the pressure it exerts when compressed to a certain length. For instance, a helical spring of 6 in. free length exerts a pressure of 100 lb. when it is compressed to a 3-in. length.

The method shown in Fig. 1 is only applicable to light springs of from 15 to 30-lb. capacity. It consists essentially of a circular flat plate to which is riveted a vertical rod. The spring to be tested is placed on the plate and weights are applied, as shown. Let it be assumed that the spring is to register 22 lb. when compressed to 1⅝ in. If the spring is correctly made of the right-size wire and wound to the correct pitch, the length will be 1⅝ in. when 22 lb. is placed on it.

Where it is necessary to measure springs of 80-lb. capacity, and upward, the foregoing method cannot be used, as it is impossible to apply enough weights for the test. For example, a spring having a free length of 4 in. should register 200 lb. when compressed to 2 in. in length. Place it on the platform of an ordinary scale and lay a strip of steel of sufficient size across its top as shown. Arrange two carpenter's clamps to hold the spring to the scale platform, as shown, but in drawing the clamp jaws together, do not compress the spring in the least. A weight representing 200 lb. is now placed on the beam end, and the clamps are drawn up until the scale registers the 200 lb. The spring is measured,



A Spring is Tested by a Certain Length of Compression with a Pressure of a Given Number of Pounds

Fig. 1

Fig. 2

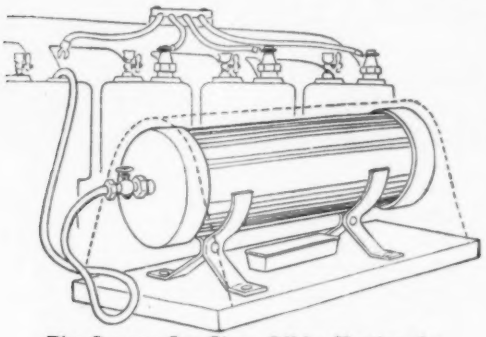
and if the length is 2 in., it is perfect.—Contributed by Adolph Kline, Newark, New Jersey.

A Decarbonizer

A decarbonizer is for use in removing the carbon from the interior of a gasoline engine with the least expense possible, as it does the work without the necessity of taking the engine apart or removing any parts whatever, except the spark plug. An inexpensive outfit for this work can be made at home as follows:

Procure a piece of copper tubing of the iron-pipe size, 3 in. in diameter and 6 in. long. While a brass tube will do, the copper is much better. Thread each end of the pipe and fit on 3-in. pipe caps. In the center of one cap drill and tap a hole for ⅛-in. pipe, and fit on a globe valve, as shown. Then

fasten the copper tube on two supports made of bar iron, shaped to be fastened on a baseboard. The supports should be of such length as to raise the tube about 2½ in. above the base.



The Oxygen Gas Given Off by Heating the Chemicals Decomposes the Carbon Deposit

Make a burner of a shallow pan, about 4 in. long and 1½ in. deep. Fill the pan with strips of asbestos and set it on the baseboard beneath the tube. Bend a piece of sheet iron to form a hood which covers the tube and fasten it to the base, so that there will be about ½-in. space on top between it and the tube. Attach a piece of rubber tubing, about 5 or 6 ft. in length, to the valve outlet.

To use the decarbonizer, remove the cap not having any connection and fill the tube two-thirds full of a mixture consisting of 3 parts potassium chlorate and 1 part of manganese dioxide. Then screw the cap in place. Place some wood alcohol on the asbestos in the burner and ignite it. Remove the spark plugs on the cylinders successively and insert the open end of the rubber tube and then open the globe valve. It will clean out every particle of carbon in the cylinders in a short time, leaving them as clean as if they had been taken apart and cleaned by hand.

When through with the decarbonizer put out the fire and close the valve; the remaining chemicals will keep for further use. Never close the valve while the fire is burning, as the gas pressure will burst the tube.—Contributed by A. H. Waychoff, Koenig, Col.

Releasing Pressure in Cylinder Oil Cups

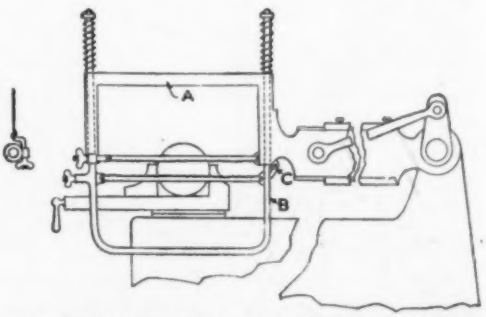
The pressure on an oil cup comes from the power stroke of the engine by gas passing the piston rings. This will cause the oil to be continually stirred up in the cup, and will retard the feed as well as make the sight feed so dark that it is impossible to know whether the oil is feeding at all.

The remedy for this is to place a horizontal check valve between the cylinder and the oil cup so that the pressure from the cylinder will close the valve. The suction on the back stroke will open the valve sufficiently to allow the oil to pass through to the cylinder.—Contributed by E. Trusheim, San Diego, Cal.

Double Cutting with a Power Hacksaw

As the sketch illustrates, a second saw frame is added to carry another blade which cuts in the opposite direction to the regular blade. The extra frame is fed upward by springs on top of the frame A, which is fed downward by its own weight; on the edge of the lower frame, at B, notches are cut, and a pawl, C, is used in them to hold the frames apart while feeding in the stock.

When the cut is about complete, the lower frame is "hooked up" with the pawl, and the cut is finished with the upper saw blade.—Contributed by Chas. Walte, Louisville, Ky.

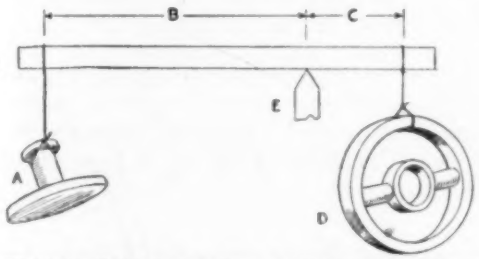


The Stock is Cut Off in About One-Half the Time of Cutting with the Ordinary Saw

Finding Weight of Castings without a Scale

Improvised methods in accomplishing a great many things give as good results as if done with the aid of regular implements for the purpose. Some time ago I was called upon to get the weights, as closely as possible, of a considerable number of irregular castings. There were no scales handy, as the castings were at a place some distance from the shop. However, one of the smaller castings was a product of the shop, the weight of which was known exactly.

A light beam was secured, and the weights were obtained very accurately by means of the laws of leverage. The weight A, multiplied by the length B and divided by the length C, will equal the weight of the object D. The location of the fulcrum E makes the balance and determines the lengths B and C.—Contributed by F. W. Bently, Jr., Milwaukee, Wis.

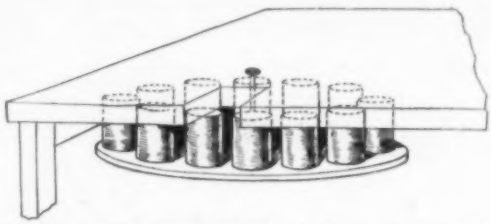


Weighing Objects by Means of the Laws of Leverage Where Only One Known Weight is at Hand

Revolving Substitute for a Bench Drawer

Where a number of small parts are handled frequently on a bench, a wheel with a number of receptacles to take the place of a drawer will be found very handy. The wheel can be made of a board, revolving on a bolt fastened to the under side of the bench top. The edge of the wheel should come flush with the edge of the bench.

The upper surface of the wheel is fitted with as many receptacles as it will hold, made of discarded tin fruit cans, or with small V-shaped boxes. A notch is cut in the bench top large enough to uncover one receptacle at the outer edge. The notch can be fitted with a hinged cover so that trash will not enter any of the receptacles.—Contributed by Lisle H. Scneder, Topeka, Kansas.

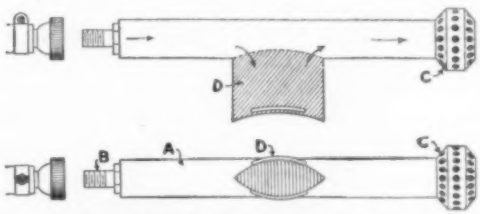


No Part of the Wheel Projects in Front of the Bench When Taking Parts from the Receptacles

Supplying Air to a Diver

The simple mouthpiece shown in the sketch provides a way to supply air to a diver. It consists of a metal tube, A, with a hose connection, B, at one end and an outlet valve, C, at the other and a mouthpiece, D, in the center of one side. The outlet may have any type of a check valve. The mouthpiece has a small wire soldered on both sides at the edge to provide a ridge that the diver can grip between his teeth. The part entering the mouth should be covered with a thin sheet of rubber to protect the mouth.

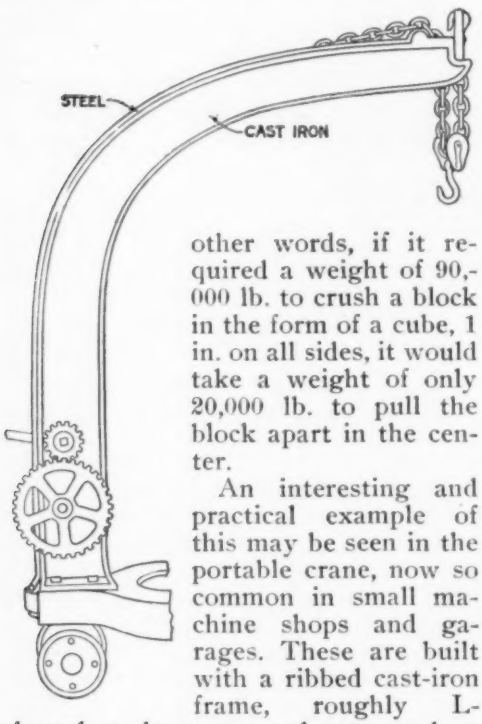
A hose of sufficient length is attached at B and an automobile tire pump fastened to the other end. In diving it is best to place a clip on the nose, then the breathing is free through the mouth. With this device a diver can stay under water a considerable length of time.—Contributed by C. Le Beuf, Jr., Westmount, Can.



The Mouthpiece is Supplied with Air Pumped through a Tube from the Surface

Strength of Cast Iron

Cast iron has great compressional strength but is weak in tension, the proportion being about 4½ to 1. In



other words, if it required a weight of 90,000 lb. to crush a block in the form of a cube, 1 in. on all sides, it would take a weight of only 20,000 lb. to pull the block apart in the center.

An interesting and practical example of this may be seen in the portable crane, now so common in small machine shops and garages. These are built with a ribbed cast-iron frame, roughly L-shaped at the upper and outer end on which the weight is lifted. When a weight is suspended it has a tendency to bend this frame; that is, the back or outside tends to be stretched or "put under tension," and the inside, to be closed up or "put under compression." The back is less than one-fourth as strong as the front. To prevent fracture of the frame, steel bands, or straps, are bent around the outside and drawn up very tightly with nuts on the ends. This subjects the steel, which is strong in tension, to the strain, and relieves the cast iron where it is the weakest.

Cooling a House in Hot Weather

The cooling of foodstuffs in hot and dry climates by means of water absorbed in burlap which hangs over the sides of a box inclosing the edibles, furnished the idea of cooling a house in hot weather. To try out the method, common cheesecloth was used on the screen frames for the windows and water run over it. The cooling effected was beyond expectations, but the cloth obstructed the light and would not last very long.

The cloth was removed and brass screen wire used in its place. The water was supplied through a system of ¼-in. pipe, which was perforated and run along the frame just above the screen. A small metal trough, at the sill of each window, caught the water and conveyed it to the drain, so as to prevent damage to the building.

It was found that the thermometer within the house registered lower on extremely hot days than on cool days. This was due to a more rapid rate of evaporation, which produced the cooling factor. The temperature of the rooms was at times lower than the temperature of the water before it reached the screens. The water supply for this system was an ordinary windmill and tank, neither of which was of unusual size, but proved adequate for the purpose.—Contributed by H. R. Spangler, Boulder, Col.

Cutting Green Poles for Rafters

When using poles for rafters, it will be found quite difficult to cut the slopes at the ends so that each pair will fit at the center and rest properly on the plates. A simple but very efficient method of accomplishing this is the following:

Select small trees that will cut the right length and thickness, taking care to get them as straight as possible. Remove the bark and cut off the limbs

Green Poles Make Good Rafters for a Cabin, If the Angles are Cut Properly

close to the trunk. A drawshave is the best tool to use for removing the bark on this kind of timber. After making the poles ready, select a 2 by 6-in. timber, about 2 ft. longer than the desired

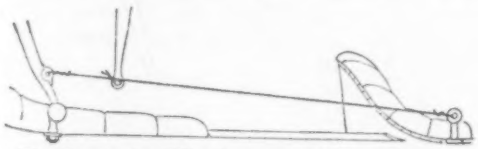
rafter, and make a miter box at each end, as shown. Figure out the cuts on the side of the miter boxes in the same manner as for a pattern rafter of sawed material. Make saw cuts in the miter boxes according to the measurements.

For projecting rafters, with a notch to fit on the plate, make the cuts in the lower miter box about 4 in. apart at the bottom. Cut the top of the rafter first, the upper cut of the lower notch next, then move the rafter back 4 in. and make the other cut. In moving the rafter lengthwise be sure that it does not turn.

Before placing the rafter in the miter box, sight along it and lay it with the straightest side down in the box, then wedge it tightly in place. This method will make a rafter as good as a sawed one, and will give a good surface for roofing boards.—Contributed by A. J. Harstad, Lenia, Idaho.

Raising an Automobile Top

When a person is riding alone and it becomes necessary to raise the top, it is almost impossible to get it in place single-handed. The sketch shows



The Connecting Wire between the Two Brackets Guides the Bow End to Its Position

an attachment that overcomes this difficulty, and one person can raise the top as quickly as two. A piece of wire is stretched from the rear bow on one side to the front-bow support. The bow to be moved forward has a loop attachment enabling it to slide along the wire. Raise the opposite side in the usual manner and the other bow will slide along to the front where it can be easily put into the bracket.—Contributed by Abner B. Shaw, N. Dartmouth, Mass.

¶In applying more than one coat of shellac varnish to patterns, sandpaper each coat before putting on the next.

Holding Work on a Drill-Press Table

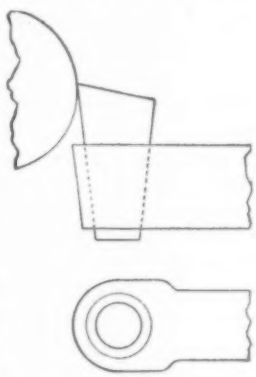
The device illustrated will hold small work firmly in position on a drill-press table for drilling. It consists of

The Holding Iron Gives a Firm Grip on the Work by Pressure from the Foot

a machine-steel rod, about ½ in. in diameter, bent in the shape shown. The hook on the upper end will slip into the slots of the table, and by applying pressure with the foot on the other end, the work under the horizontal part will be held tightly in place, so that both hands are free to operate the table.—Contributed by D. C. Goff, Knoxville, Tennessee.

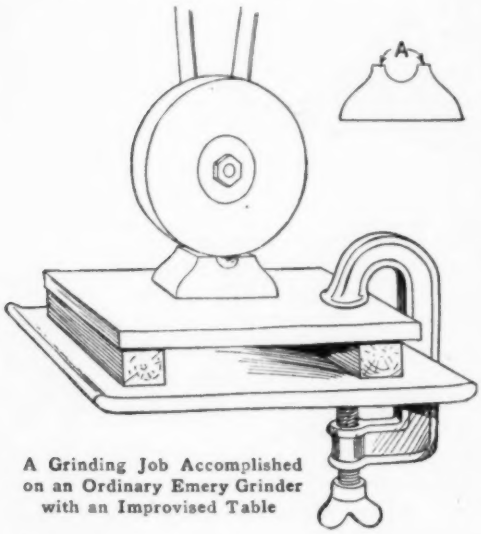
Heavy Roughing Tool for a Lathe

A very strong roughing-tool holder may be made by shaping a piece of steel to fit in the tool post of a lathe and boring a standard taper hole in one end, to receive a tool made from the taper shanks of broken end mills, which are usually made of high-speed steel. When they break the taper shanks can be used for tools in this holder which will last a considerable length of time. When the cutting edge is ground down too low, the shanks can be driven out and others substituted.—Contributed by Charles Homewood, Cedar Rapids, Iowa.



A Substitute Surface Grinder

While working on a job in the woods, some castings were received which were only partly finished. Their



A Grinding Job Accomplished on an Ordinary Emery Grinder with an Improvised Table

bottoms were planed off, but the surfaces A on top were still in the rough. These had to be finished very accurately, and there was neither time to return them to the city nor a machine at hand to do that kind of work. As there were 30 castings, to chip and file them was out of the question. An emery wheel mounted on an iron stand was found in the mill's equipment, and it was decided to do the work on it.

An iron plate that had one machined face was found, and two blocks of wood were sawed out to pass under it so that, when placed on the pan of the machine, the top of the plate was approximately the desired distance below the emery wheel. The plate was held by a clamp. The castings were sorted and the highest ones shoved along the plate under the wheel. Then thicknesses of paper were put under one of the blocks so that the grinder would remove more metal. All the castings were finished in this way, and very quickly. A good, true-ground surface was the result, the paper layers giving a fine adjustment for close fitting.—D. A. H.

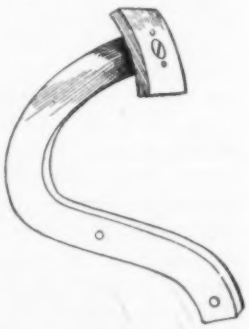
Card-Writing Pens Made of Wood

Instead of using brushes or shading pens, procure three pieces of soft white pine, about the size of a lead pencil, and sharpen one end to a feather edge, like a slender wedge, making them into three widths, $\frac{1}{32}$ in., $\frac{1}{16}$ in., and $\frac{1}{8}$ in., respectively.

These three pieces, with a 1-ft. rule and two triangles, will make a good, durable and efficient outfit. The wood brushes are dipped in the ink, drawing or card-writer's ink, and used as a lettering pen. When these pieces of pine become filled with ink, they will retain a sufficient quantity to do considerable work, but the main advantages, over either pens or brushes, lie in the fact that anyone, with no experience, can do good work, making sharp, clear-cut letters easily and rapidly. These brushes improve with use, and if one is broken, another can be quickly made.—Contributed by J. B. Murphy, Plainfield, N. J.

An Automobile Clutch Pedal

An automobile mechanic was called upon to make a clutch pedal to replace a broken one. A forge and anvil were at hand, and although not a skilled blacksmith, he made a very serviceable pedal in the following manner: The main part was bent up from a piece of ¾ by 1½-in. steel. The footplate was made from a piece of ¼-in. flat steel. It was fitted to the end of the arm part and fastened with a ⅜-in. countersunk-head screw, in the center, and two ¼-in. dowels. It proved to be a substantial job.



¶Incase the ends of revolving shafting and avoid an accident.

Rough Check for a Direct-Current Watt-Hour Meter

By ARTHUR MOORE

The watt-hour meter is an instrument for measuring electrical energy used by a customer in a given time. The principle of the ordinary watt-hour meter for direct current is as follows: The current passes through two coils of wire, A, Fig. 1, and thus produces a magnetic field between them, which will vary in strength with the current. A very light armature, B, is mounted on a vertical shaft, C, between the coils, and this armature has a current run through it which is taken directly from the main line. The resistance of the armature circuit is high and hence it takes a very small current; and since its resistance is constant, the current through it varies with the electrical pressure between its terminals, which is the voltage of the main circuit.

When there is a current in both the armature and stationary coils, there will be a torque excited on the armature, causing it to rotate. The value of this torque will depend upon the value of the currents in the two circuits, or it will vary directly as their product; and since the current in the armature circuit varies as the voltage of the line, the torque varies as the product of the voltage and the current, which is the power in watts. The energy in any circuit is equal to the product of the power and the time; thus if the power taken by a certain circuit is 10 watts and it is constant for one hour, the energy would be equal to 10 watt hours. If the power taken by the circuit is 20 watts, then the energy in one hour will be 20 watt hours. Since the meter is to record the energy, it is obvious that the record shown on the dial D must vary directly as the power, when the times are the same, hence the speed of the meter's armature must vary as the power.

Some sort of a load must be put on the armature shaft so that its speed will vary directly as the torque. Such a load is provided by a copper disk, E, revolving between the poles of permanent magnets, F. The torque required to drive such a disk varies directly as the speed, and as a result there will be the proper relation between the speed and the power. If the armature shaft be connected to a train

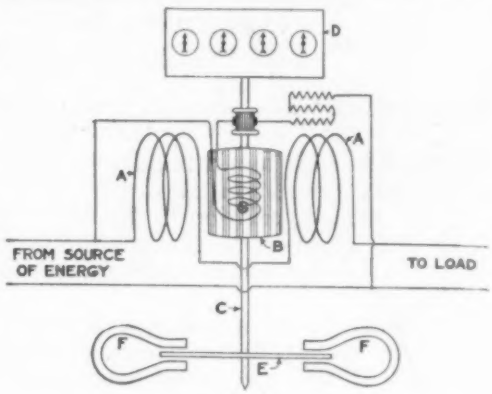


FIG. 1
Diagram of an Ordinary Watt-Hour Meter Showing Connections and Manner of Construction

of gears by means of a worm gear, the total revolutions of the armature may be registered with pointers mounted on the shafts of the gears and arranged to move over suitable dials. The total number of revolutions of the armature indicated on the dial, multiplied by the watt hours required to produce one revolution, will give the total watt hours of energy. In the majority of cases, the dials are direct-reading, and no constant is required.

A stationary coil, G, is connected in series with the armature, and it should produce a magnetic field of sufficient strength to almost cause the armature to revolve when there is no current in the coils A. If this adjustment is properly made, the armature will start to revolve when a very small current is sent through the coils A, and the meter will register for low loads; otherwise a considerable current would have to be sent through the coils A before the armature would start to turn. When the magnetic effect of the coil G is too

great, the armature will rotate when there is no current in the coils A, and the meter is said to "creep" when this is the case.

The disk constant of the meter is the

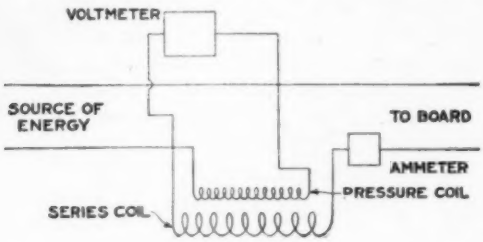


FIG. 2

Wiring Diagram Showing Where the Voltmeter and Ammeter are Placed for Recording the Current

number of watt hours required to produce one revolution of the disk. It bears a definite relation to the value of one division, in watt hours, on the lowest reading dial and is often called the "gear ratio."

In order to test a meter, it is necessary to know the current passing through it and the voltage impressed on the pressure circuit. An ammeter and voltmeter will be required to make the measurements accurately, and the connections for a two-wire meter

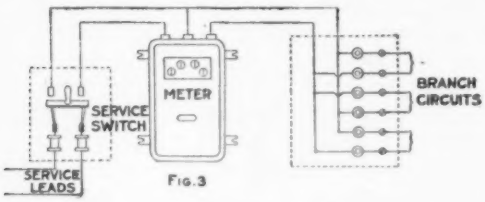


FIG. 3

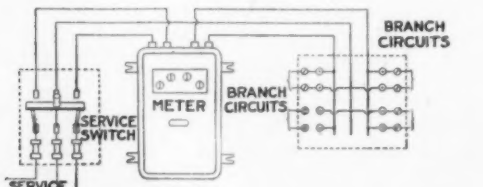


FIG. 4

Diagram Showing the Connections for a Two-Wire and a Three-Wire Watt-Hour Meter

should be made as shown diagrammatically in Fig. 2. The load current should be maintained constant while the armature makes a certain number of revolutions. The time required for the armature to make a number of revolutions should be carefully noted; and the accuracy of the meter may be determined as follows: The current indicated on the ammeter, multiplied by the value of the voltage indicated on the voltmeter, gives the power. This product, multiplied by the fractional part of an hour required for the armature to make a certain number of revolutions, gives the value of the watt hours the meter should indicate.

The disk constant of the meter, which is usually marked on the dial, multiplied by the revolutions of the disk, gives the indicated watt hours. The difference between the true and indicated watt hours is the amount the meter is in error. For example, suppose a 220-volt, 25-ampere, two-wire watt-hour meter, having a disk constant of 2, gives the following results under test on a load of 25 amperes: Average voltage, 220; average current, 25 amperes; time taken for the disk to make 120 revolutions, 3 minutes. Since the disk constant is 2 and the armature makes 120 revolutions, the indicated watt hours will be equal to 120×2, or 240. The power is equal to 220×25 or 5,500 watts. The time is $\frac{1}{20}$ of an hour, and hence the true watt hours will be equal to $\frac{1}{20}$ of 5,500, or 275. The meter then reads $275 - 250$, or 25 watt hours slow when the true watt hours are 275, and the per-cent error is equal to $(25 \div 275) \times 100 = 9.09$.

When an ammeter and voltmeter are not available, an approximate check may be made by using lamps, whose current consumption is known, and assuming that the voltage remains constant. This, however, is very unsatisfactory and should be used only in extreme cases.

The connections of an ordinary two-wire meter are shown in Fig. 3, and those of a three-wire meter, in Fig. 4. The three-wire meter should be checked when the load is balanced.

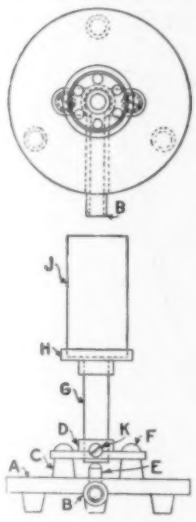
¶An old sprinkling can, with the sprinkler head removed, makes a convenient device for filling an automobile radiator.

Relieving Jar of Hammer Handle

When using a small hammer on quite heavy work, it often happens that the handle vibrates and causes a very unpleasant feeling in the hand. To remedy this, bore a ⅜-in. hole, about 2 in. deep, in the large end of the handle and fill it tightly with beeswax. Long handles in large sledges can be treated in the same manner, but the hole should be larger and deeper and completely filled with the wax.—Contributed by E. C. Stevens, Detroit, Mich.

A Bench Gas Heater

The illustration shows a type of gas heater which, in many instances, takes the place of the forge in hardening and tempering small tools, such as taps, drills, counterbores, etc.

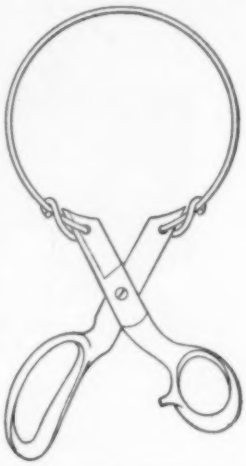


The base A is made of a casting, 4½ in. in diameter and ⅜ in. thick. A 5/16-in. hole is drilled at B for the gas intake, and the stem is turned to fit a piece of ½-in. rubber hose. Holes are then drilled and tapped in the posts C for the flange D, and for the gas tip E. The flange D, which is held to the base A with screws F, is bored to fit the piece of tubing G, which is 4 in. long. The casting H is bored to fit the top of the tube G, and to receive the cupola J, which is made from a piece of 1¾-in. tubing, 4½ in. long. Holes are drilled in the under side of the casting H for admitting air.

With a good volume of gas and the mixer K properly adjusted, the burner will heat a piece of steel, ⅜ in. in diameter and 1 in. long, in a short time.—Contributed by E. P. Fickes, Dayton, O.

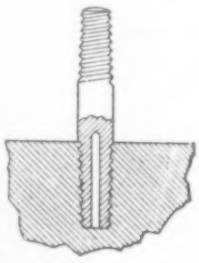
Removing Screw Tops on Fruit Jars

An old broken pair of shears can be made into a useful tool that will come in handy during the canning season, or at any time that a fruit can is to be opened. The broken ends are ground to make them rounding, and a hole is drilled in each end large enough to allow a wire, about ⅛ in. in diameter, to pass through them. The wire is formed as shown, and the ends are fastened in the holes. It should be of such length as to reach over the fruit-jar cover when the shears are opened. Place the wire over the cover and close the shears with a good grip. The wire then takes a good hold on the cover, and it is an easy matter to tighten or loosen it.—Contributed by J. J. Kolar, Maywood, Illinois.



Small Hole in Stud Bolt

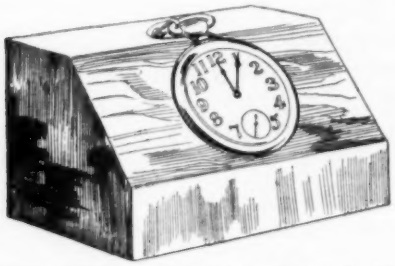
A broken stud presents a difficult job to repair. The remaining end is hard to remove without doing damage to the threads in the metal where it is fastened. A very good plan is to drill a small hole in the stud when making it; then, if it breaks, it is not a hard job to make a large drill follow the small hole, and a drift can be used in turning out the shell.



¶When out of cast-iron flux or scaling compound for welding, fine common salt makes a good substitute.

Desk Block for a Watch

In a great many places where it is necessary to know the time at any moment, a watch is a very convenient guide. If the watch is placed flat on



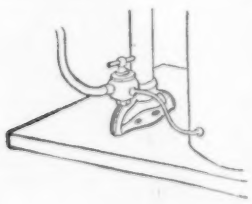
The Block Places the Watch in Such a Position That It is Easily Seen

the table or desk, it is not always easily seen, and then, too, it is liable to be pushed off and broken. The sketch shows a desk block which was used with a great deal of satisfaction.

The recess in the top of the block is for the chain, which need not be taken from the watch. The slight angle of the block, which is hollowed out to receive the watch, makes the dial clearly visible from almost any point of view. For convenience and safety in connection with the continual use of a timepiece this suggestion is hard to excel. The block is easily made and finished to present a pleasing appearance on any desk.

A Tire-Fluid Gun

The sketch shows the way I connected a 12-in. tire foot pump to a tank so that it would take tire fluid from the tank and force it into a tire. The plunger of the pump was equipped with double leathers, and a three-way valve was attached at the base. The tank and foot pump were fastened solidly to a baseboard, and a ¼-in. copper tube was connected between the valve and tank.

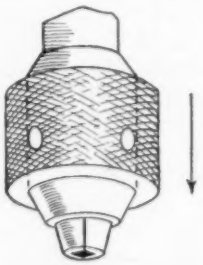


The operation is simple. Turn the valve to make connections between the tank and pump cylinder, then draw out the plunger. This will draw a charge of fluid into the pump. The valve is then turned, to connect the hose that is attached to the tire valve, and the plunger is forced down the same as for filling the tire with air.

The device is always ready to use, can be attached quickly, and a tire treated in a very short time.—Contributed by Hill, Pasadena, Cal.

Taking a Drill Chuck Apart

The ordinary drill chuck is so cheap and durable that one seldom gives its construction a thought. Occasionally, however, it is necessary to take one apart for some purpose, and the person who is not familiar with its construction will find this a hard task. Such a chuck is illustrated herewith. A knurled sleeve, drilled for the spanner, surrounds the body, and turning this sleeve loosens or tightens the drill in the jaws. There is no sign of threads, setscrews, or pins, to hold this sleeve on, but still it stays in place and turns around.



This outer sleeve is pressed on and a movement longitudinally will remove it. After it is off, the assembly of the chuck is readily apparent. The chuck is assembled by pressing the sleeve back into its proper place. Sometimes the sleeve becomes loosened after long service and slips when a drill must be held very tightly. The remedy is to remove it and shrink it up a little. To do this, heat the metal to a red heat and immerse in cold water. Repeat this operation if the piece is very loose. Press it back in place, and the sleeve will hold like new.

¶A reamer should not be turned backward in a hole.

Patterns for Cylinder Flanges

By J. A. SHELLEY

Flanges for small cylinders are usually sawn from a solid piece and fitted over the prints after they have been turned to size, but in some instances grooves are turned for the flanges, as shown in Fig. 1. This makes a good job, but one that has been discontinued on account of the difficulty in removing the flanges for alterations, especially if they have been nailed through the ends. The plan of fitting directly over the prints is better in all cases, as it provides for easy alteration and the fitting and fastening of the flanges without removing the cylinder from the lathe centers.

For thick flanges of large diameter, segments are the proper thing. If the

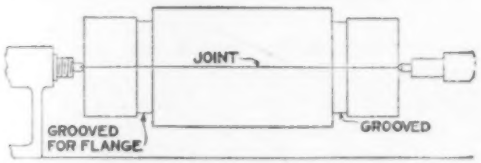


Fig. 1—Grooves Turned in the Core Prints of a Pattern for Receiving the Flange

combined thickness of the flange and fillet is not too great, one course will do, but it will need to be strengthened at the joint where the segment ends come together. There are several ways of doing this, and the most common one is to saw grooves in the ends and fit a feather with the grain running directly across or at right angles to the joint. Another way is to bore holes part way through the segment ends with the joint for the center and glue pieces of dowel pins in them for feathers. Both these forms of feathering are illustrated in Fig. 2.

Very thick flanges, or those with large fillets, will have to be built of two or more courses of segments on a faceplate, and should be rough-turned before fitting to the barrel prints, but if there is a good band saw at hand, do not try to turn the inside to fit over the prints, as it can be sawn to fit in a fraction of the time required to turn it.

In building one course of flanges, make an allowance inside and out for sawing after the glue has set. Glue it up in halves after jointing, and clamp

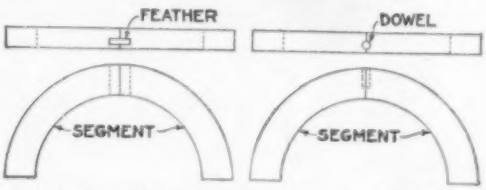


Fig. 2—Two Methods of Feathering, to Strengthen the Joint of the Flange Parts

it to a straight plate. If they are to be grooved on the circular saw for feathers, be sure to mark the joints before taking them apart, as there might be some mistake in putting the right segments together. If a dowel is to be used, do not attempt to bore the hole until the glue has thoroughly dried.

It sometimes happens that the lathe has sufficient swing between centers to turn the barrel and prints, but not the flanges. In this case the flange will have to be finished completely on the lathe faceplate and fitted to the barrel after it has been removed from the lathe centers, or it may be that the lathe is long enough to turn the barrel but not the prints or flanges, and in this case they will have to be built together on a faceplate and fastened to

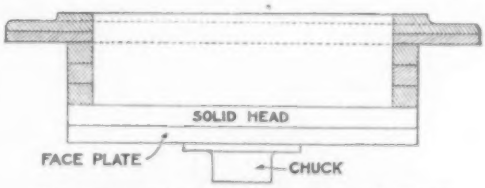


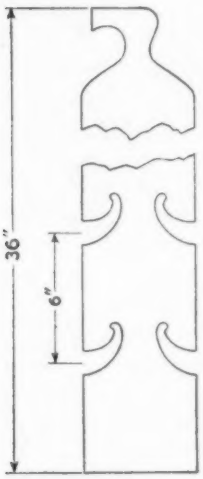
Fig. 3—A Section of a Core Print and Flange Made in One Piece on a Faceplate

the barrel after it is taken from the lathe. A section of a print and flange built together is shown in Fig. 3.

¶A mechanic should never wear jewelry on the hands while working at a machine, as it is apt to catch on the work and cause a serious injury.

Cuspidor Carrier

The time required to empty, clean and return a large number of cuspidors was greatly reduced by using a carrying device which permitted more than one vessel to be taken at once. The material used in the construction is maple, about ¾ in. in thickness, the length and width depending on the size and number of cuspidors to be handled.

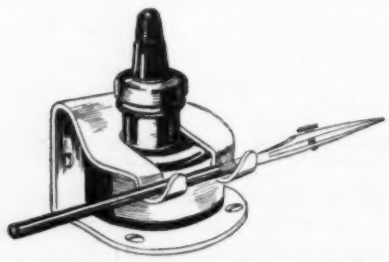


The notches cut in the edges are about 1¼ in. wide at the opening, and are made the shape of the rim on the cuspidor. The shape of the handle shown is one selected from several as being the most satisfactory to take hold of without an uncomfortable position of the hand.

Each notch receives a cuspidor, which is easily hooked into position and taken out by lifting with an outward turn of the bottom.—Contributed by D. L. Converse, Erie, Pa.

Drafting-Table Inkstand

A very handy holder that will prevent the spilling of ink on a drawing may be easily made as shown in the sketch. The holder consists of a piece of sheet brass, about No. 16 gauge, bent to the proper shape. If the ends of the spring arms are turned up slightly, they will provide a place for the pen when it is not in use. Holes are drilled in the bottom and back of the holder so that it may be fastened with screws to the wall or table.—Contributed by C. A. Allen, Whetinsville, Massachusetts.



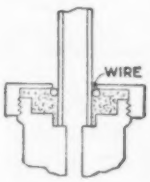
The Holder Prevents the Spilling of the Ink and Provides a Place for the Pen

Towels for Mechanics

Printers, garage men and machinists are very hard on towels. The ordinary bath or crash towel quickly wears out under the treatment which it receives in the shop. If a mechanic cares more for utility and economy than for appearances, a more serviceable towel can be made from a grain sack. These sacks can be procured cheaply from a feed store. A large-size sack will make two towels.

Making Loose Packing Nut Hold the Gasket

In many instances where the hole through the packing nuts, used on water or lubricator glasses, is too large for the glass, the gasket is easily squeezed through the space between them, and a leaky connection soon develops. This is also apt to cause the breaking of the glass. The sketch is descriptive of a quick method of overcoming the difficulty and making the old nut as serviceable as a new one.



A piece of No. 12 or 14 gauge copper wire is bent in a circle to the exact outside diameter of the glass. It is then wound with a cord to prevent breaking the glass. The body of the wire prevents the gasket from passing up through the opening caused by the oversize of the nut, and the pressure of the gasket keeps it firmly in place. In places where a new nut cannot be readily made or procured, this kink will eliminate a great deal of trouble.

¶ Be sure to oil the surface of work to be knurled.

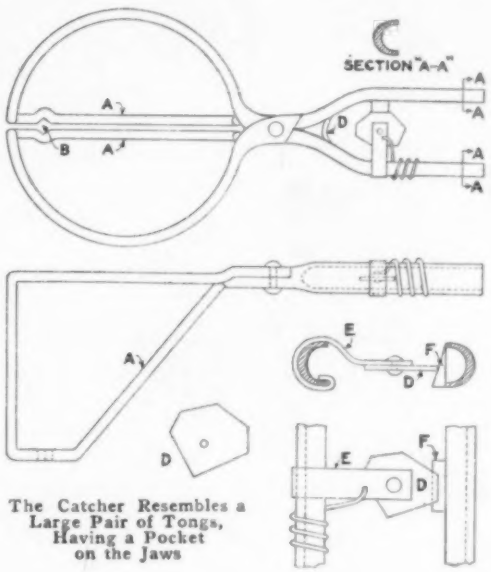
A Hot-Rivet Catcher

By ALVIN L. YOUNG

Hot rivets are usually caught in a bucket or keg when they are thrown by the person at the forge. The men throw these rivets quite accurately, but if one goes aside, then there is some danger to the person trying to catch it, especially if he is standing on a beam. This bad feature is entirely eliminated by using the catcher shown in the sketch. It not only catches the rivet, but places it without having to pick it up with the tongs.

The general make-up of the catcher is similar to a large pair of tongs, with the jaws in half circles, to make the opening about the size of an ordinary bucket, the two parts, A, coming closely together when the handles are closed. The device for adjusting the opening B to any certain rivet is shown in the detail sketch. The disk D is of irregular shape, having several straight edges, each of which is at a different distance from the hole that forms the axis. This disk is riveted to a clip, E, fastened to one of the handles as shown, so that it can turn slightly upward. The disk is not riveted so tightly but what it can be turned. A slanting piece, F, is fastened to the opposite handle to receive the edge of the disk.

The sides of the jaws, from the round part to the lower sloping pieces, are covered with wire netting or asbestos. When a hot rivet is caught in the

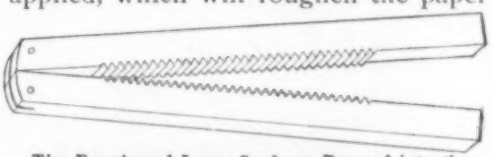


The Catcher Resembles a Large Pair of Tongs, Having a Pocket on the Jaws

pocket thus formed, it falls to the bottom where it easily drops into the hole B, which is adjusted to its size by the disk D. With a good grip on the handles, the disk D and its holder, E, are forced up the slanting piece F, and the rivet is gripped so that it can be placed.

A Homemade Check Protector

A device that will effectually prevent the raising of the amount written on a check can be made from two pieces of metal, hinged like a nutcracker and having a series of notches filed in the edges of their inner surfaces. The pieces are about 6 in. long and ⅜ in. square. A slot is cut through one end of each piece and a small, thin piece of metal is fitted in them. When riveted loosely in place it forms a substantial hinge. The notches should be stepped off and filed accurately so that they will mesh closely together. After the amount is written on a check it is placed between the pieces and pressure applied, which will roughen the paper



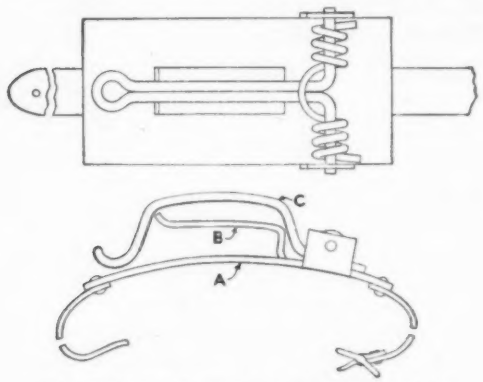
The Roughened Inner Surfaces Pressed into the Paper over the Written Amount Effectually Protect It

in such a manner that the amount cannot be readily changed.

¶Kerosene oil is a good lubricant for reamers used in aluminum.

A Scissors Holder for Paper Hangers

Scissors are a troublesome tool to keep in sight and in a handy place when wanted, and especially so for the paper

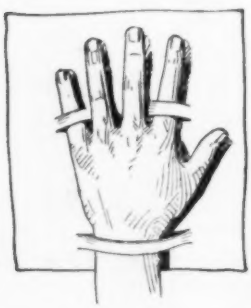


The Holder is Strapped in the Right Position to Receive the Scissors from the Hand

hanger. The illustration shows a holder to take the place of a pocket in the overalls. It consists of a strip of metal, A, to which is attached a clip, B, for holding the scissors, and a spring, C. Straps are riveted to the ends of the metal, A, to be used in attaching the holder to a limb of the user. The scissors are easily slipped behind the spring by the natural swing of the arm and it is not necessary to look where to put them.—Contributed by F. C. Myre, Tacoma, Wash.

Leather Hand Protectors

Workers handling hot irons or carrying heavy objects, such as a stove, use some kind of pad to protect the hands.



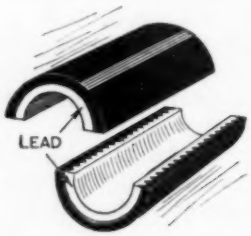
One of the best things I have seen for this purpose is a piece of leather, cut from a boot top and with slits made in it, as shown, so that it will slip over the wrist and the little and forefinger of the hand.—Contributed by James M. Kane, Doylestown, Pa.

A Rubber Sanding Block

When smoothing boards with sandpaper the usual method is to wrap the paper around a block so that a better grip for the hand may be had and at the same time covering the surface more evenly than could be accomplished without it. On uneven work the block would only touch the high spots and for this reason it is better to use a block of soft rubber about 5 in. long, 3 in. wide and 1½ in. thick. Its surface is yielding and with the pressure of the hands it forces the sandpaper into the low parts and smooths them as well.

Clamps for Holding Polished Pipe

A pipe coupling makes a good gripping device for highly polished brass or nickeled pipes. A pipe coupling is procured that will allow about ¼ in. space between its inside diameter and the outside diameter of the finished pipe to be gripped. Take a piece of smooth pipe the same size as the nickeled pipe and place it centrally in the coupling. The ends of the openings are stopped up in the same manner as in babbitting a shaft, and the space is filled with melted lead. When cold, cut the coupling in two with a hacksaw. The clamps may be used in tongs or in a vise.—Contributed by W. C. Loy, Rochester, Ind.



Changing Resiliency of Automobile Springs

The reason that an automobile of the roadster type is hard-riding is as follows: The manufacturers use one chassis for both its runabout and touring bodies and naturally expect that the touring car will be required to carry a greater passenger load in addition to

the extra weight of the body. The same springs are used for both bodies, and to protect himself, the manufacturer makes them strong enough for the larger load, with the result that there is not enough resiliency for the lighter car. To "soften them up," shock absorbers are used, but before applying them, it will help still more if the lower leaf—the short one—is removed from the lower half of the spring. After doing this, the motorist should be careful not to overload his car.—Contributed by Donald A. Hampson, Middletown, New York.

Drawing Work Tightly on the Lathe Live Center

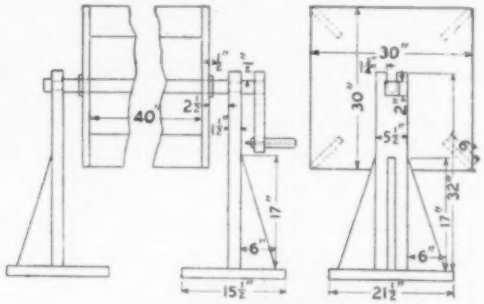
It often happens that the steady rest has to be used when doing a lathe operation on a piece of work. If the piece has been previously turned up on the centers and subsequent operations must be accurate, the end which is usually placed in a chuck should be fastened snugly against the live center. This can be quickly accomplished in the following manner.

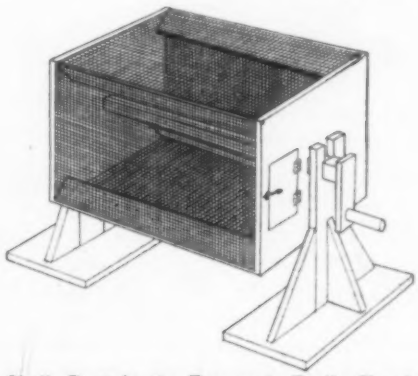
Attach a dog, or driver, on the part to be worked, and place it between centers in the usual way, with the steady rest in the correct position, and unscrew the faceplate about three turns. Procure a piece of rawhide belt lace, about 3 ft. long, lace it tightly around the driver and through the faceplate, and tie it firmly. It is obvious, that when screwing the faceplate back in place against the shoulder on the spindle it will draw and hold the work securely against the live center. The tailstock can then be removed and the work begun.

An Eraser Cleaner

The eraser cleaner consists of a box with solid ends and the four sides covered with coarse wire mesh. The boards, set at an angle in the corners, and the axle serve to beat out the dust in the erasers as they fall from one to the other when the box is revolved.

The ease with which erasers are cleaned in this manner makes it possible to run them through often, which





The Chalk Dust in the Erasers is Easily Knocked Out as They Roll in the Box

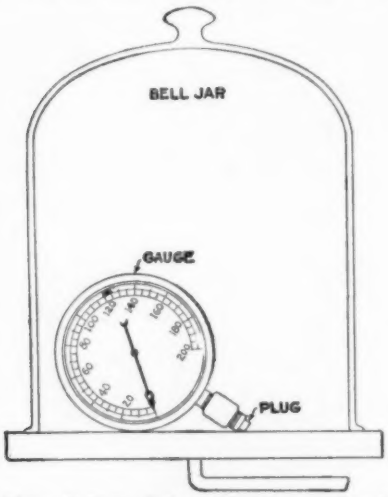
will reduce the amount of dust in each room of a public school.—Contributed by John L. Cooley, Farmington, Me.

Finding Air Pressure in a Bell Jar

In the course of some experiments I had occasion to determine with some degree of accuracy the air pressure in a bell jar from which the air was partly exhausted by means of a vacuum pump. I was without a suitable manometer tube and likewise without the wherewith to construct one, but solved the problem in a very simple and satisfactory manner by making use of a steam gauge which was at hand.

For the purpose, the inlet pipe of the gauge was plugged, a pipe coupling having been screwed on the nipple and a plug inserted in the end of the coupling, the joints being made tight with red lead to prevent leakage. The gauge thus arranged, was introduced into the

jar. The air pressure within the coil of the gauge could not change as the pressure of the atmosphere in the jar



The Plugged Coil of the Steam Gauge Records the Air-Pressure Reduction within the Jar

lowered, but the confined air acted in the same manner as air under pressure with the gauge used in the ordinary manner. The hand, of course, registered the drop in pressure or the difference in pressure between the air in the jar and the air in the coils of the gauge. Subtracting this reading from the pressure of the atmosphere, as determined by a barometric reading, gave the exact pressure of the air in the jar which was desired.—Contributed by J. Naveman, Brooklyn, New York.

Slip Bushings for Jigs

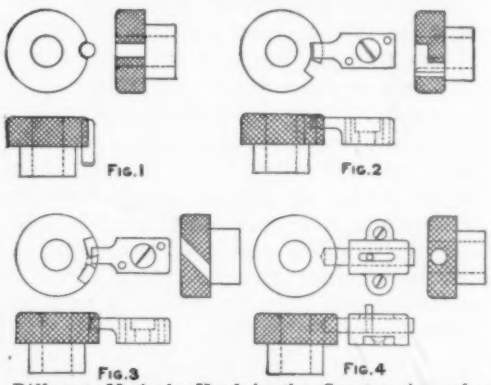
Parts that are drilled and reamed in a jig at one setting usually require slip bushings, one each for the drill and reamer, and sometimes more for subsequent operations. Unless some means is provided to prevent it, the bushings will turn with the tool, which rapidly wears both the stationary and slip bushings. It is obvious that the accuracy of the jig is quickly lost under these conditions. The sketch shows some of the different methods used, which are simple and inexpensive and will give satisfactory results.

That shown in Fig. 1 is perhaps the simplest of them all: the straight pin prevents turning, but does not keep the bushing from working upward. It does very nicely where there is a limited number of parts to be worked, or in extreme cases where the cost of the tool is the first consideration.

A method that is much used and gives satisfaction is shown in Fig. 2. The cutting of the step makes this one a little more expensive than the others. The rotation of the tool keeps the notched part of the bushing solidly against the finger.

A method that gave better results than any of the others is shown in Fig. 3. A slot is cut on an angle of 45 deg., which was found ample to keep the bushing firmly seated and at the same time not wedge itself to prevent turning with the fingers in the opposite direction for removing.

The one shown in Fig. 4 is kept in place with a pin and plunger. It may be further improved by adding a small spring, to prevent any tendency of the plunger to work out. Its principal advantage is the simplicity of work on the bushing, although the plunger and housing are more expensive to construct than the other similar devices.



Different Methods Used in the Construction of a Holding Device for Jig Bushings

It is sometimes advisable to leave the dowels out of the fingers shown in Figs. 2 and 3. In case the tool catches or sticks in the bushing, it will turn, using the screw as a pivot, and prevent breaking the end from the finger. —Contributed by A. Dane, Pottstown, Pennsylvania.

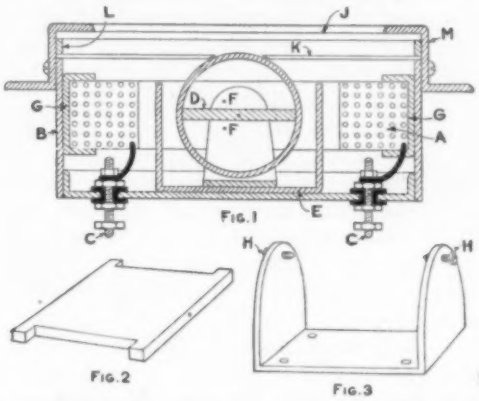
How to Make a Battery Charge-and-Discharge Indicator

By R. A. McCLURE

A cross section of the complete indicator is shown in Fig. 1. It consists of a coil of wire, A, mounted inside of a metal case, B, and provided with two terminals, C, with a permanent magnet, D, mounted on a horizontal axis inside the coil and having its position controlled, when there is no current in the coil, by the soft-iron yoke E. A very light tube of nonmagnetic material is attached to the permanent magnet and is, as a result, rotated as the position of the magnet changes by the action of a current in the coil. The surface of this tube moves past an opening in the dial of the instrument, and its position will serve as an indication of the direction of the current in the coil when the proper marks have been made for currents of known direction.

The principle of the instrument is the following: The permanent magnet D assumes the position shown when it is perfectly balanced and there is no current in the coil. When a current passes through the coil, a magnetic field is established within it, whose direction depends upon the direction of the current in the coil, and whose strength increases or decreases with the current. The permanent magnet is turned from the zero position due to the action of the current, and if the effect of the yoke E were entirely removed, the magnet would come to rest in a vertical position. If the current in the coil be reversed, the magnet would then be turned through 180 deg. The turning of the magnet is limited by two stops, F, and as a result the yoke E is always tending to bring the magnet back to its original position, and when the current in the coil is reduced to zero, the magnet again assumes its initial position.

When a storage battery is being charged, the current is sent through the circuit in the reverse direction of that in which the battery discharges. Thus, if the coil of the indicator be connected in series with the battery, it is obvious that the magnet will turn in one direction when the battery is charging and in the opposite direction when it is



General Arrangement of the Parts for Constructing a Battery Charge-and-Discharge Indicator

discharging. Under these conditions, the position of the cylinder affords a suitable indication as to charge and discharge, and the words "charge" and "discharge" may be printed on the surface of the cylinder, so that one or the other appears when the cylinder is at either of its extreme positions. The word "neutral" may also be printed on the surface of the cylinder so it will be in sight when there is no current in the coil.

The diameter of the containing case is 2¼ in., and the various parts are in about the same proportion as shown. The wire used in the coil should have sufficient cross section to carry the maximum current that may pass through it without undue heating, and its resistance should always be as low as possible, so as to prevent an excessive loss in winding. The coil may be fastened inside the containing case by means of four pieces of thin brass, soldered to the inside surface of the case so that the ends may be bent down over the sides of the coil as shown at G. Both terminals of the coil come

out on the same side and are fastened to two terminals, mounted on the back of the containing case and insulated from it.

The exact form of the magnet is shown in Fig. 2. It should be made from a very good grade of steel and well magnetized after having been properly tempered. Two small recesses are made in the sides of the magnet, to accommodate the points of the trunnion screws that are to support it.

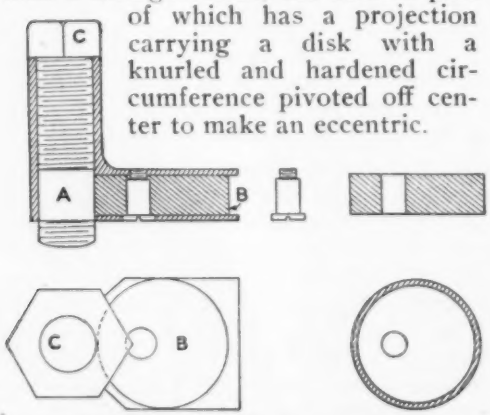
A thin tube of insulating material, as long as the magnet is wide and having an outside diameter equal to the maximum length of the magnet, should be obtained. Two small notches are cut in each end of this tube to accommodate the four projections on the magnet, whereupon the tube is sprung over the magnet.

A soft-iron yoke is made from a piece of iron, a little narrower than the magnet, so that it may be mounted within the coil. The part resting on the back of the containing case may be made as broad as the base of the U-shaped support for the magnet. This support is shown in Fig. 3. Two small steel screws, H, with their ends ground down to a fine point, are placed in two threaded holes in the upper ends of this piece. This piece and also the soft-iron yoke may be fastened to the back of the case by means of two or more screws passing through holes in them and into threaded holes in the back of the case. The back of the instrument may be fastened to the shell of the case, by means of small machine screws, with their heads countersunk so as to be below the surface of the case.

A glass cover, J, is placed over the top of the instrument and raised above the piece, K, by means of a narrow ring, L. This glass cover, the ring L, and the disk K, are all fastened to the shell of the case, as shown, by means of a ring M. The projection on this ring will serve in mounting the indicator on a board, a hole being drilled in the face of the board equal in diameter to the outside diameter of the main part of the case. All electrical connections to the indicator can then be made back of the board.

A Stud Extractor

The extractor consists of a sleeve with a hexagon head, the bottom part of which has a projection carrying a disk with a knurled and hardened circumference pivoted off center to make an eccentric.



The Gripping Part of the Extractor Takes Hold on the Stud Where It Has No Threads

The advantage of this extractor is that the gripping part comes in contact with that portion of the stud A having no threads, which is in the center or close to the joint. The threaded portion of the stud is protected inside of the extractor. The grip of the eccentric disk B will be tighter as the pull is applied to the hexagon part C, and is easily released by a slight backward turn.—Contributed by Richard Flagen, Cardiff, England.

Care of Automobile Drive Chains

The wear that comes on exposed drive chains is caused mostly by dust and grit settling on and mixing with the lubricant on the chain. This wear is more noticeable on trucks than on any other vehicle. It is a fact that chains will last nearly twice as long if they are removed and thoroughly cleaned in gasoline, and then boiled in paraffin wax. When cool, the wax becomes hard, and keeps the bearings

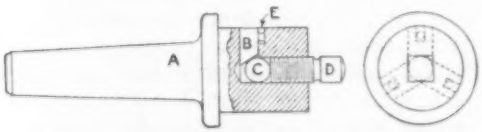
and moving parts well lubricated. This stops the rattle, and furnishes a coating to which dust will not adhere readily.

Base Trimmer for Paper Hangers

Various styles of devices are used for trimming wall paper at the edge of the baseboard and around casings. One of the best things for this purpose is a shoe knife with a serrated cutting edge. The paper is temporarily pasted to the baseboard or casing, and with a sawing motion of the knife held in line with the baseboard edge, the paper is neatly cut. The paste adhering to the woodwork should be wiped off before it dries.

Solid Expanding Arbor

It is often convenient to have an expanding arbor for use in light facing operations, finish-turning cuts, and



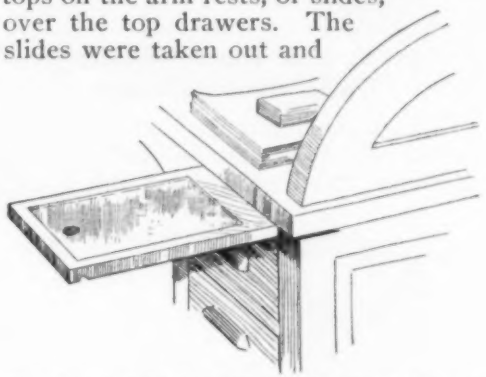
The Three Points of Contact are Forced Out Equally from the Center with the Screw

similar work, to be held and driven by the lathe spindle direct. The one shown in the illustration has proven that it will hold the work perfectly true with the bore after long and hard service. The shank, or body, A, was made of tool steel, but not hardened. The three expanding fingers, B, are hardened tool steel, beveled on one end to 30°, with a small pin, working in the slot E, to prevent their turning in the holes. The projecting ends were turned off in position, to make them perfectly true, so that they would grip the finished bore of the pieces to be mounted on the arbor without marring them. The turning up of the setscrew D drives the ball bearing C with equal pressure on all three fingers B, which hold with a firm and positive grip.

¶Never set a plane flat on a bench.

Glass Tops on Desk Slides

As I was in need of a glass top for my desk and without means to get one, I hit upon the idea of making glass tops on the arm rests, or slides, over the top drawers. The slides were taken out and

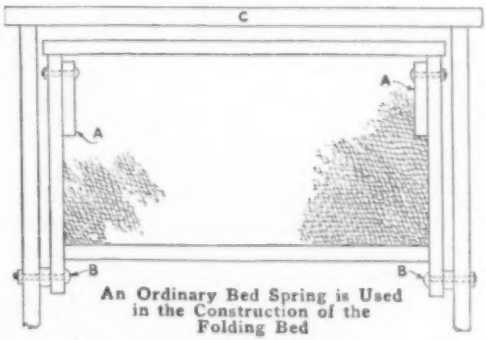


The Glass is Set into the Wood Slides Deeply Enough to Protect the Sharp Edges

a recess cut in them to receive a piece of double-strength window glass. A hole was bored in the end of the slide, large enough for a finger to be inserted from the under side to raise the glass. This provides an excellent place to keep data.—Contributed by Peter J. Theisen, Denver, Col.

Homemade Folding Bed

A comfortable folding bed can be made from an ordinary wood-frame bed spring. A frame is built around the spring frame of 1-in. material, the



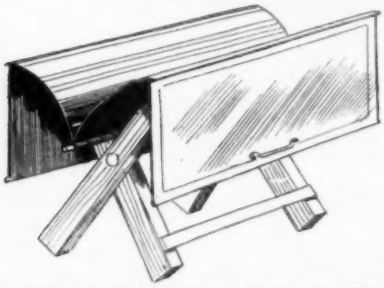
An Ordinary Bed Spring is Used in the Construction of the Folding Bed

edges projecting above the spring for holding the mattress, and below for the folding legs, A. The end pieces extend beyond the frame to receive the bolts, B, that act as a hinge.

The outside frame, or cover, C, can be made plain or ornamental to appear like a mantel. It consists of two ends and a top, and is fastened to the wall. The front is draped with a curtain divided in the center.

Rack to Hold Automobile-Engine Hood While Painting

When repainting or varnishing an automobile it is very difficult to have the hood stand upright without falling

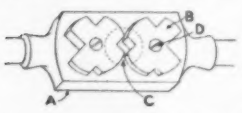


The Shape of the Sawhorse Holds the Hood in the Right Position for Painting

over and spoiling the paint. To have it fall would mean doing the work over. A simple way to overcome this trouble is to secure a wood sawhorse and lay the hood on it, as shown in the illustration.—Contributed by Carl Kaufmann, Santa Ana, Cal.

An Adjustable Tap Wrench

A very efficient tap wrench, that answers the purpose well, can be made as shown. A piece of cold-rolled steel,



A, about ⅜ in. thick and 1¼ in. wide, is cut long enough to allow two round disks, about ¼ in. thick and 1 in. in diameter, to be fitted on it. Notches are cut or filed into the disks B so that, when two notches of equal size are opposite each other, they form a square opening. The disks revolve freely on the screws D, which are turned into the plate A. A hole, large enough for the largest tap, is drilled at C. Handles are attached to the holder ends as shown. When a tap is in the notch the disks cannot turn.

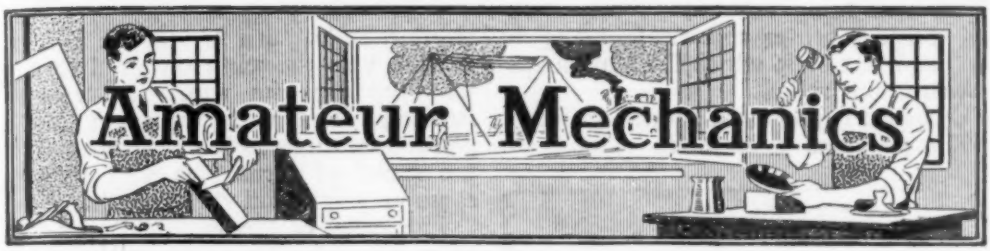
Portières Made of Corn Kernels

Desiring to have a portière a little different from the usual kind, I experimented with kernels of corn and found them to be far superior to the beads or paper tubes used in making the Japanese kind. Ordinary field corn was selected and shelled and the kernels were placed in a pan, and enough boiling water was poured in to cover them. This softened the corn and prevented worms from eating into the kernels. The corn was allowed to soak for 24 hours. Too much at a time should not be prepared, as it will become sour.

The kernels are strung on No. 8 cotton thread, as it comes double from the needle, about 1 ft. longer than the opening where the portière is to be used. The extra 1 ft. will take care of the shrinkage. Use only sound kernels and thread them on in one way; that is, each kernel in the same position as the previous one, using care not to push them on too hard to cause them to split.

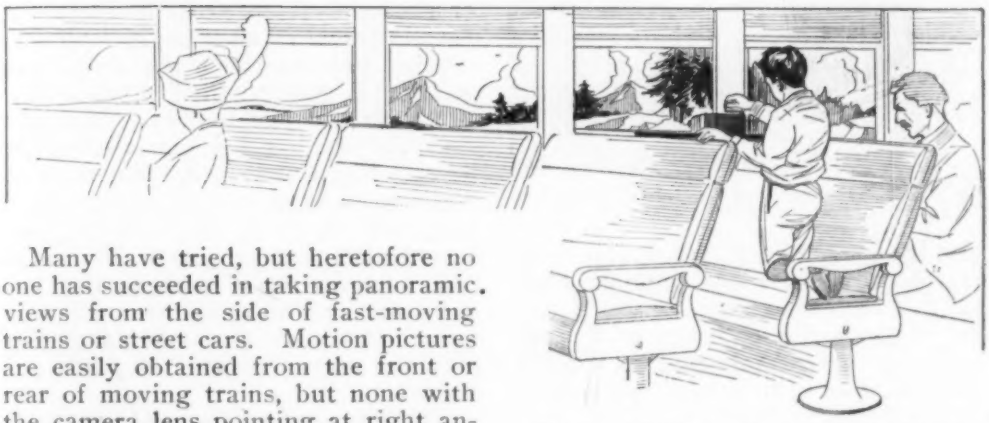
The corn will shrink some in drying, and each string should, therefore, be looked over and the kernels pushed together. Make a loop at one end of each string to fit the pole, and be sure that all strings are of the same length. They are then ready for varnishing, which is done by dipping a few at a time in varnish warmed a little. They are then hung on a stick or old pole to drain and dry. Allow them to dry thoroughly, but not rapidly. When dry, they are hung in place on the pole. The ends of the threads can be trimmed even with shears, as the kernels will not slip off.

The kernels may be dyed any color desired and designs worked in with different colors of corn, although this is not so pretty as the plain color. The length of the strings may be varied to suit the taste. One very nice method is to make the strings quite short at the center of the curtain and gradually increasing in length toward the sides.—Contributed by Earl Zander, Three Rivers, Mich.



The Mile-O-View Camera

By T. B. LAMBERT

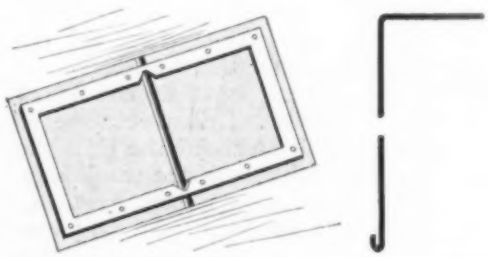


The Board Used Instead of a Tripod is Placed across the Backs of Two Car Seats

Many have tried, but heretofore no one has succeeded in taking panoramic views from the side of fast-moving trains or street cars. Motion pictures are easily obtained from the front or rear of moving trains, but none with the camera lens pointing at right angles, or nearly so, to the track. A complete apparatus for taking continuous and perfect panoramic pictures of any desired length as one travels through a country is too complicated to be described in detail within the limits of this article, but a simple arrangement, invented and constructed by the writer, will enable anyone to perform the experiment at practically no cost except for the film.

Some form of a roll-film camera is essential, and simply as a working basis, it will be assumed an ordinary camera is used, post-card camera in size, for which the following things will be required: A piece of thin black card, or hard rubber; a small board, and a piece of wire to be used as a crank.

Prepare the paper, or hard rubber, by cutting it to a size that will exactly cover the rear camera opening when the back of the camera is removed, which, in the case of a post-card size, is 6 in. long and 3¾ in. wide; then cut a narrow slot, about $\frac{3}{64}$ in. wide crosswise through the center of the material. This slot should extend to within about ½ in. of each edge, and the edges must be perfectly smooth and straight. If paper is used, glue it

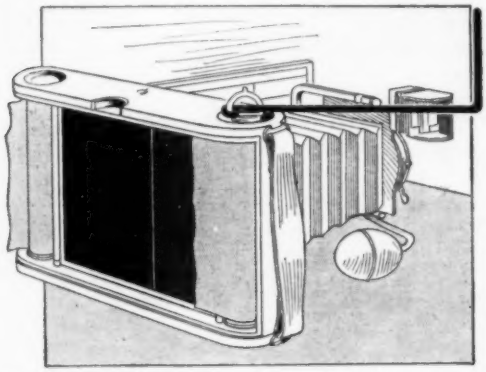


These Two Articles Constitute the Only Parts Necessary to Change a Camera into a Mile-O-View

to the opening in the camera. If hard rubber is used, it can be made up as shown and set in the camera opening.

This will bring the slot directly back of the lens center and at right angles to the direction in which the film moves when being rolled.

A board is prepared, about 4 ft. long, 10 in. wide and ¾ in. thick. This is to



The Two Parts as They are Applied to an Ordinary Roll-Film Camera

take the place of a tripod, and it must have a small hole and suitable wing nut to attach the camera near the center. This length of board will reach from the back of one seat to another when it is placed to support the camera during the exposure.

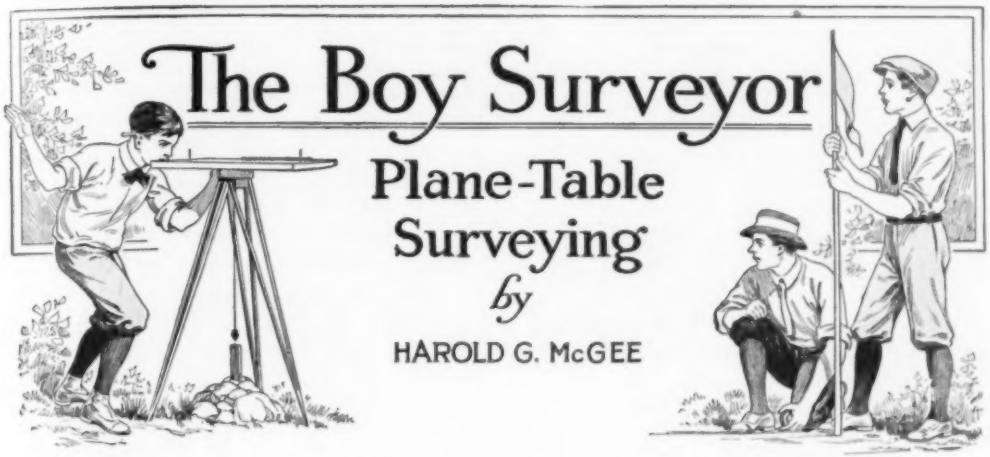
A wire, about ⅛ in. in diameter, is bent, as shown, with a short hook on one end, and the other turned up at right angles, to serve as a handle. This wire, when hooked into the wing nut, will enable one to wind up the film at a fairly uniform speed. This completes all the necessary apparatus.

To take pictures with this panoramic outfit, load the camera in the usual way, but do not wind it up to exposure No. 1; stop at a point where the beginning of the film will be nearly opposite the narrow slot in the black paper, or rubber. This would be to stop the turning at about the time the hand pointer appears in the small back window. Attach the camera firmly to the board and brace up the lens end so that it will not easily shake with the movement of the car. Place the board across the backs of two adjacent seats, so that the camera will point out of the window at exactly right angles to the car.

When ready to expose, open the shutter wide, turn the crank that is hooked into the wing nut, and slowly wind up the film while the train is running. This will give a panoramic picture, continuous in character, and if the speed of turning is well judged, some very splendid views can be made.

The speed of turning the crank will be governed by the focal length of the lens and the speed of the train. For an average lens, the crank should be given one turn per second when the car is traveling about 15 miles an hour, or the average speed of a street car. A train traveling 30 miles an hour will require two turns of the crank per second. A good method of trying this out is to use one film as a test and turn the crank a few times and note its speed by the second, then stop and begin again at another speed for a few turns and so on, until the entire film is exposed, always noting the turns and time for each change, also the speed of the train. When the film is developed the one that shows best will give the proper number of turns per second.

The following points must be considered: The track should not be rough, and the camera must be perfectly steady and not twisted out of position by turning the crank, otherwise the resulting picture will be wavy. If the slot in the back board is not smooth and true, the picture will be streaked. Turning the film too fast will make the picture elongated, and too slowly, condensed. Should the camera be pointed otherwise than at right angles the picture will be distorted. This arrangement cannot be used to take moving objects except under special conditions. A picture of a passing train of cars can be made if the camera is stationary, but the wheels and drive rods will appear twisted out of shape. It is best for the experimenter to confine himself to scenery at the beginning, avoiding architectural objects, because a variation in speed of turning the crank to wind the film naturally distorts the architecture, which variation is not so noticeable in a scenic view.



The Boy Surveyor

Plane-Table Surveying

by

HAROLD G. McGEE

[In the training of a boy for a trade or profession there is none so profitable for outdoor work as that of a surveyor. This article sets forth how to accomplish surveying and the making of simple maps with the use of commonplace tools that any boy can make.—Editor.]

Surveying and map making have always been two of the most interesting things a civil engineer has had to do. And, like George Washington, many of the men we look up to today as successes in different lines worked as surveyors in their younger days. Surveying takes one out of doors, and is apt to lead him into the unknown and unexplored byways of the earth.

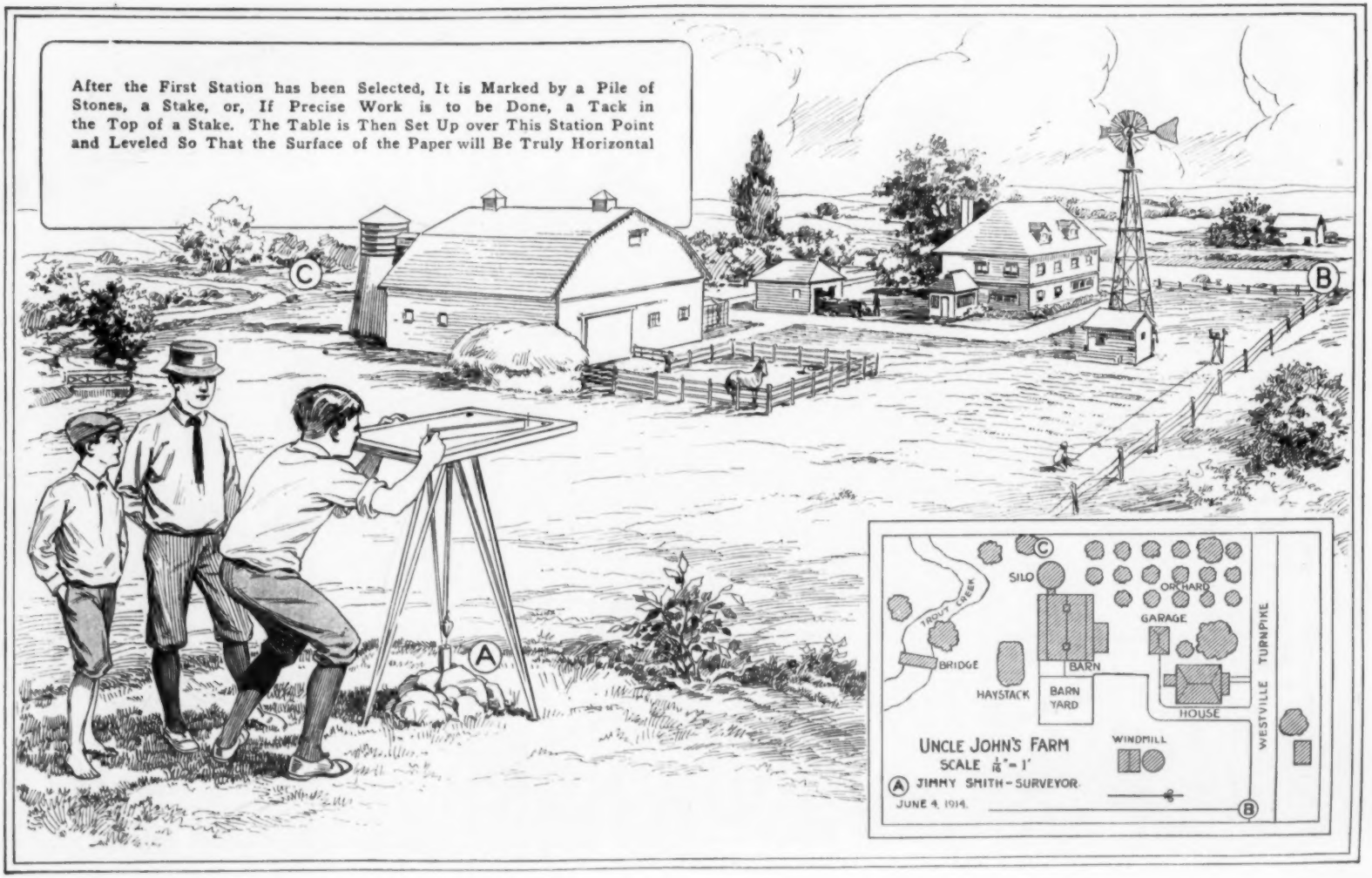
Though modern surveyors often use precise and expensive instruments, creditable surveys can be made with simple and inexpensive apparatus. Of such apparatus, two of the simplest are the plane table and the camera. Since one must know the principles of plane-table surveying before he can do camera surveying, this paper will describe the plane table alone, leaving the camera for another chapter.

A plane table is simply a drawing board mounted on a tripod so that it can be set up and worked upon in the field. One kind of plane table, which is used in the army for reconnaissance, does not even have a tripod; it is simply strapped to the arm of the man who is using it.

Plane-table maps vary greatly in scale and the area they represent. Landscape artists' plans may show only single city lots, while some topographic maps cover hundreds of square miles on a single sheet. For maps of a small farm, a park, or a residence block in the city, a plane table is almost ideal, since plane-table maps are made with rather simple apparatus and do not require much actual measuring on the ground. Most objects are located without ever going to them, or even sending a rodman to them.

Just a Few Weeks After George Washington's Sixteenth Birthday, in 1748, Lord Fairfax, Owner of a Large Estate in Virginia, Took Him into His Employ as a Surveyor

After the First Station has been Selected, It is Marked by a Pile of Stones, a Stake, or, If Precise Work is to be Done, a Tack in the Top of a Stake. The Table is Then Set Up over This Station Point and Leveled So That the Surface of the Paper will Be Truly Horizontal



Besides the plane table itself and a sheet of paper, only a small carpenter's level, a tape to measure a few distances with, and some spikes for markers, a hard lead pencil, a ruler, and a few needles are absolutely necessary for this sort of a map.

To start a plane-table map, a station must first be selected from which as many as possible of the objects to be located on the finished map can be seen. Ordinarily, the objects one would locate are corners of buildings, fence corners, intersections of roads, corners of lots, banks of streams, possibly trees, and section and quarter-section corners in the country. A railroad, a lake, a mountain, or anything which forms a noticeable landmark in any particular locality, ought to be on the map. In mapping a territory which has never been surveyed before, the first surveyor may name the hills and streams.

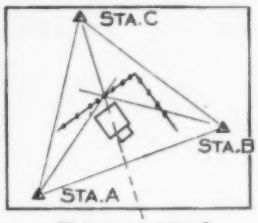


TABLE AT STA.C

Three Stations are Used for Setting the Plane Table in Succession to Locate the Various Objects

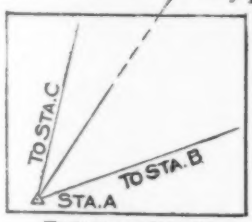


TABLE AT STA.A

After the first station has been selected, it is marked by a pile of stones, a stake, or, if precise work is to be done, a tack in the top of a stake. The table is then set up over this station point and leveled so that the surface of the paper will be truly horizontal. Generally, too, the board is "oriented," that is, placed so that two of its edges point north and south and two east and west. It is then clamped so that it will not move while working on it.

To begin the map, a point on the table is chosen to represent the station on the ground over which the table is set. This point is marked by sticking a fine needle into the paper, vertically. A small triangle should be drawn around the needle hole in the paper and labeled "Sta. A," so that it will not be lost in the maze of points which will soon cover the sheet. By sighting past this needle toward some object which is wanted on the map, like the corner of a house, its direction can be marked by setting another needle on the far side of the table, in line with the first and the given object. Then, if a ruler or straightedge be placed against these two needles and a fine line drawn connecting them, this line will show the exact direction of the object from Sta. A. All the other objects which are wanted on the finished map and can be seen from Sta. A are located by direction in the same way.

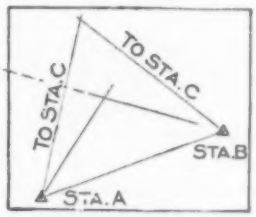
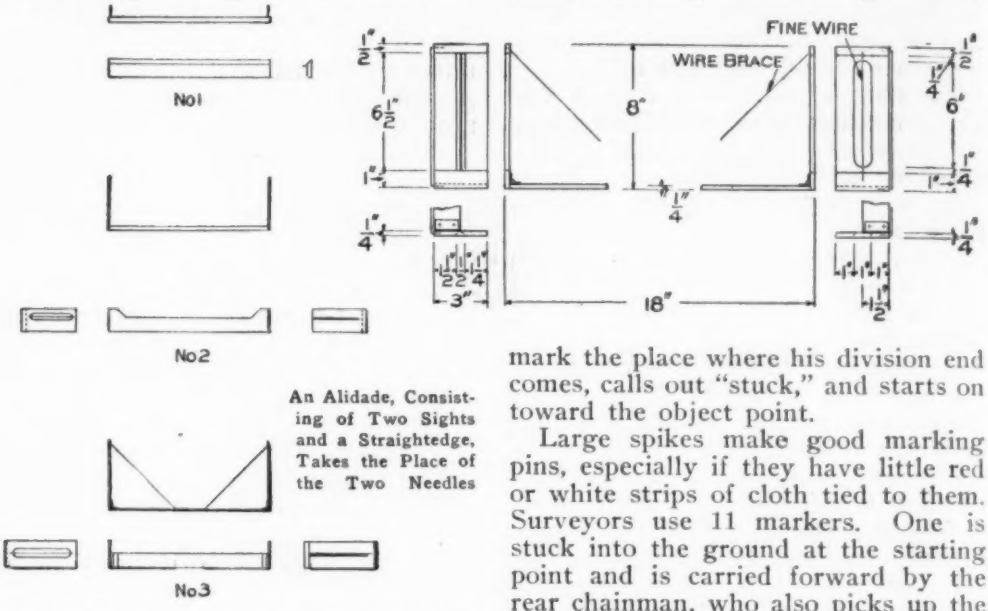


TABLE AT STA.B

The first points to have their direction thus marked ought to be the next stations to be occupied. If all the objects to be located can be seen from three stations, or even two of three stations, three stations will be sufficient. The distance to one of them from Sta. A should be carefully measured and laid off to scale along its direction line on the map. Its place on the map should be marked exactly as the first station was, substituting B for A. It is wise, after every few sights at other objects, to take a sight along the line AB to make sure that the board has not turned. A good map is impossible if the board twists.

To measure the distance between

stations, a 50 or 100-ft. tape, or some accurate substitute, is necessary. An ordinary piece of iron telegraph wire, 105 ft. long, is a good substitute. A



An Alidade, Consisting of Two Sights and a Straightedge, Takes the Place of the Two Needles

point, about 2½ ft. from one end, is marked with a little lump of solder. A chisel dent in this solder will mark one end of the 100-ft. section. Then, with a borrowed tape or a good rule, measure off and mark every 10 ft., just as the first point was marked, until the entire 100 ft. have been laid off. The last 10 ft. should be divided into feet. In all this measuring and marking, the wire must be stretched out taut and straight. The extra 2½ ft. at each end are used for making handles. By estimating the tenths of a foot, measurements can be made with such a tape, or "chain," as an old-time surveyor might call it, just as accurately as they can be laid off on the map.

Two men are required for measuring, or "chaining," a head and a rear chainman. The rear chainman holds the 100-ft. end of the tape on the station point, while the head chainman takes his end forward toward the station to which they are measuring. When he has gone nearly the length of the tape, the rear chainman calls "halt." The head chainman stops and draws the tape up tight, while the rear chainman holds his division end on the starting point. Then the head chainman sticks a spike into the ground to mark the place where his division end comes, calls out "stuck," and starts on toward the object point.

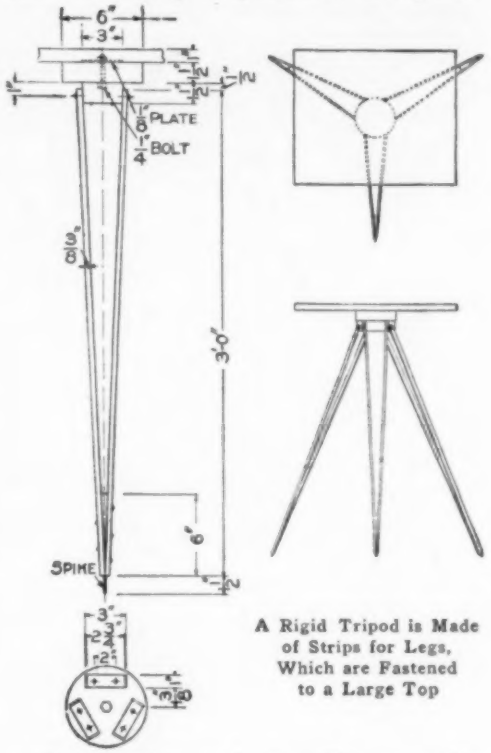
Large spikes make good marking pins, especially if they have little red or white strips of cloth tied to them. Surveyors use 11 markers. One is stuck into the ground at the starting point and is carried forward by the rear chainman, who also picks up the markers at each 100-ft. point as soon as the head chainman calls "stuck." In this way, the number of markers which the rear chainman has in his hand is always the same as the number of hundreds of feet which the last set marker is from the starting point.

In measuring between two points, care must be taken to draw the tape out taut and straight, its two ends must be level with each other, and it must be exactly in line with the two points between which the measurement is being made. In measuring downhill, one end may have to be held up high, and the point on the ground where the end division would come, found by dropping a stone from the place where it is in the air and watching for the spot where the rock strikes the ground. A surer way to do this is to hold a plumb-bob string on the last division and carefully let the bob down until it touches the ground. A rod with a red or white flag on it ought to be placed at or just beyond the point to which the measurement is to be made so that the rear chainman can

easily line in the head chainman. The latter, before he places his marker, looks back to the rear chainman to be told whether or not he is "on line" with the object point. If he is not, and ought to go to the rear chainman's right to get "on," the latter holds out his right arm and the head chainman moves accordingly. When he reaches the right point, the rear chainman signals "all right" by holding out both of his arms and then dropping them to his side; the marker is stuck, and both move up a hundred feet and repeat the process.

After all the points possible have been located from Sta. A, and the direction lines labeled lightly in pencil so that they can be distinguished when the board has been removed from the station, the plane table is picked up and carried to Sta. B. Here it is again set up, leveled, and oriented by making the direction of the line AB on the paper exactly the same as that of the line from Sta. A to Sta. B on the ground. This is done by placing needles at points A and B on the table and then turning the board until the two needles and Sta. A are in line. Sights are taken on the same objects which were "shot" at Sta. A, and to objects which were not visible from Sta. A. The intersection of the lines of sight toward a given object from A and from B marks the location on the paper of that object. If the two ends of a straight fence have been located in this way, a straight line joining the points will show the location of the fence on the map. By exactly similar methods, every other object is located on the paper.

In order to avoid errors, it is an excellent scheme to locate three stations near the outside edges of the area to be mapped, and locate all objects possible by sights from each of the three stations. If, instead of all three crossing each other at a point, the lines of sight from the three stations form a triangle, something is wrong. If the triangle is very small, it may be safe to use its center as the correct point; if not, the work must be repeated and checked. Locating even a few points by this method may prevent some bad blunders. The three stations ought to form as nearly as possible, an equilateral triangle; and the distances between all of them should be measured and laid out accurately on the plane table.



A Rigid Tripod is Made of Strips for Legs, Which are Fastened to a Large Top

There are two ways in which the map may be finished, inked, or traced. By drawing in the "culture," that is, the things built by man, like the houses, the fences, the roads, and the railroads, in black ink; the topography, that is, the hills and valleys, in brown; the water, in blue, and then erasing all the construction lines, a very neat map can be made. Another way is to get some "onion-skin" paper, or some tracing cloth, tack it over the penciled map, and trace the lines right through, using black India ink. This tracing can be blueprinted, just as a photographic film. A plain, neat title, describing location of map; who made it and when; the scale used; why it was made, if it was made for a special pur-

pose, and the direction of the north point, ought to be on every map. The topographic sheets published by the United States Geological Survey are

From an Original Drawing of a Survey of Mount Vernon, Made by George Washington at the Age of 14

good samples to follow. They have been published for a great many places all over the country, and single copies can be obtained by sending 10 cents to the Director, United States Geological Survey, Washington, D. C.

Plane tables are almost as easily made as they are bought. If there is no old drawing board around the house, a new bread board from the ten-cent store will serve. For ordinary work, a table which is 15 or 20 in. square will do very well. The board must be mounted on a tripod so that it will be rigid while it is being worked upon and yet can be unclamped and oriented. A brass plate, with a hole in it and a nut soldered over the hole, screwed to the bottom of the board will permit the board and tripod to be bolted together in good shape. Another method, which is not nearly as good, is to drill a hole clear through the board, countersink it on top for a bolt head, and bolt the board and tripod head directly together. With the brass plate and nut, the camera tripod can be pressed into service if a nut of the proper size has been used. The camera tripod is, however, apt to be wabbly with a drawing board on top; a much more satisfactory tripod can be built as shown in the accompanying drawings. Each leg is made of two strips of wood, ¾ by ⅜ in. and 3 ft. long. These strips are screwed together at their lower ends, gripping a spike between them which will prevent the legs from slipping on the ground. The tops of the strips are spread apart and screwed to the opposite ends of an oak or maple cleat. This cleat is, in turn, screwed to the under side of the circular tripod head.

In place of the two needles and the ruler described for marking the line of sight, most plane-table men use an alidade, which is a combination of two sights and a straightedge. A very simple alidade may be made by mounting two needles on a ruler. The straight edge of the ruler is placed against the needle which marks the station at which the plane table is set up. Then, by swinging the ruler around this needle until its two sighting needles come in line with some object, the line of sight can be drawn directly on the paper along the edge of the ruler. A surveyor in India once made an alidade out of a piece of straightedge and two sights made of native coins hammered out by a native blacksmith. Two pieces of cigar box, one with a fine vertical saw slit in it, and the other with a vertical slot and a piece of fine wire or silk thread stretched down the center, glued to a well planed, straight, flat piece of wood, make a fine alidade. A careful worker may be able to put his sights on hinges so that they will fold down when not in use.

More than anything else, map making rewards care and accuracy, and shows up slipshod workmanship. If the pencils are sharp, the lines fine, and if the work is checked often, beautiful maps can be made with very simple apparatus.

¶ White marks on waxed surfaces may be removed by rubbing lightly with a soft rag moistened in alcohol, after which rub with raw linseed oil.

A Magic String

Procure a few pieces of cotton string, each about 1½ ft. long, and fill them well with soap. Prepare a brine by dissolving three tablespoonfuls of salt in a cup of water. Place the strings in the brine and allow them to soak for two hours, or longer. It is necessary that they be thoroughly saturated with the brine.

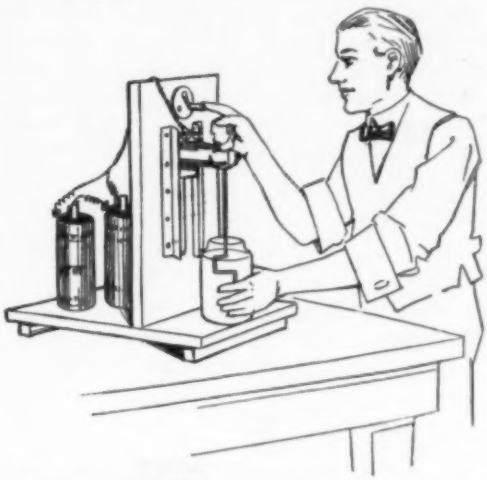
When taken out of the brine and thoroughly dried, suspend one of them from a nail on a ledge, and hang a finger ring on its lower end. Apply a lighted match to the string and allow it to burn. The ring will not fall, but will hang by the ash.—Contributed by C. Frank Carber, Dorchester, Mass.

Edging Flower Beds

To improve the appearance of a flower bed, it must be edged evenly and quite often. As this became a tiresome task, I constructed an edger, as shown in the sketch. It consists of a wheel on a 4-ft. length of material, 2 by 4 in. in size, made tapering and having a cross handle, 18 in. long, attached to its end. The wheel is 8 in. in diameter, and the cutter is attached, as shown, across the center of the wheel axle, to make the edger turn easily on curves and corners. The cutter is 12 in. long and turned under 1½ in. It is pushed along in the same manner as a garden cultivator.—Contributed by A. S. Thomas, Amhurstburg, Can.

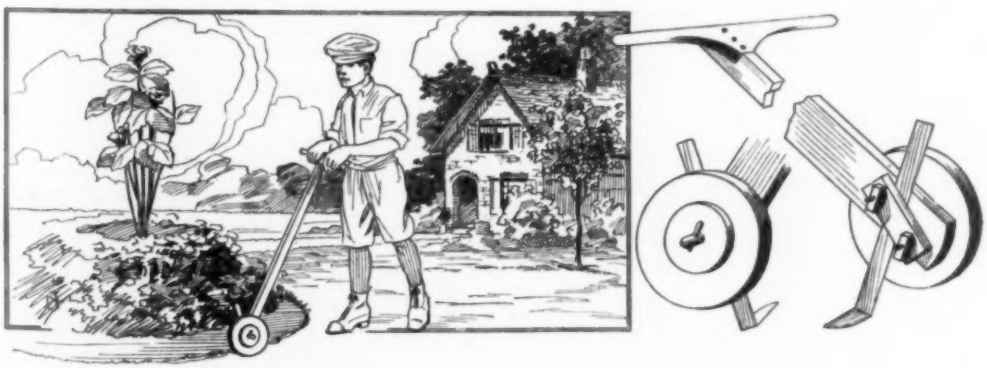
An Electric Stirring Machine

Desiring a stirring machine for mixing photographic chemicals, I set about to design the one shown in the illustration. The base and upright are made of pine, 1 in. thick, the former 8 in. wide and 10 in. long, the latter 8 in. wide and 16 in. long. A ⅜-in. slot, 12 in. long, is cut in the center of the upright, and two pieces of sheet metal or tin, 2 in. wide and 12 in. long, bent at right angles along the center of their length, are placed at equal distances, on each side of the slot, and fastened with screws. The distance between these pieces depends on the motor used, as its base should fit snugly between them.



A Self-Contained Electric Stirring Machine for Use in Mixing Photographic Chemicals

A small battery motor is purchased,

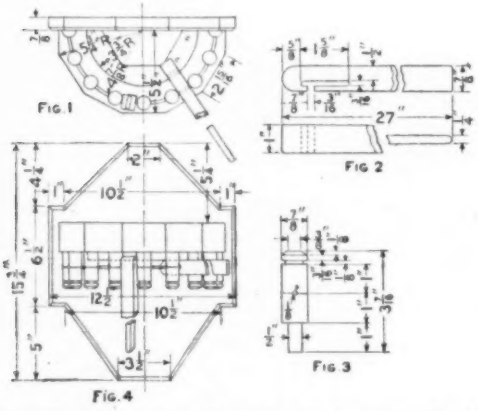


An Edger, Similar to a Garden Plow, for Quickly Trimming the Sod around a Flower Bed

and its shaft is removed and replaced with one measuring 10 in. in length. To the end of the shaft is soldered a piece of wire, bent as shown in the sketch. A bolt is attached to the center of the motor base, so that its threaded end will pass through the slot in the upright, where it is held with a wing nut. The battery cells may be placed on the back of the upright and a small switch mounted at the top and in front. —Contributed by Ray F. Yates, Niagara Falls, N. Y.

A Clothes Rack

The rack is constructed of hard wood throughout, and as each piece is made, it should be sandpapered and varnished



Any Number of Arms Up to Its Limit may be Used at a Time

or otherwise finished. The plan view is shown in Fig. 1; the construction of an arm, in Fig. 2; and the pin, in Fig. 3.

The base is ⅞ in. thick and of the dimensions shown in Fig 4. The projection on each side, measuring 6½ in. long and 1 in. wide, is made separately and glued to the main part after dressing and beveling the edges.

The shelf consists of material 2 in. thick and made in a semicircular form on a radius of 5¾ in. On this arc, lay off chords, as shown in Fig. 1; the first ones on each side being one-half the length of the others. Carefully square up the edges for appearance. To lay off the post holes, scribe an arc of a circle on a 4⅞-in. radius. Start at the edge on this arc and lay off eight chords of equal lengths, and bore ½-in. holes on the marks.

The posts are turned up, as shown by the detail, Fig. 3. This will require seven posts and two half posts. The half posts are secured to the base with small brads. The round part at the end is turned slightly tapering, so as to make a tight fit in the hole of the shelf. After stringing the posts on a piece of brass wire, ⅛ in. in diameter, and bending it in the proper shape, the posts are glued in the holes.

A T-shaped slot with a long top and a short leg is cut out with a scroll saw in one end of each arm. Make sure to have each slot exactly ½ in. from the upper side of each arm. All edges should be well rounded to prevent tearing of the clothes.

Make a semicircular platform for the arms to bear upon when extended. This may be either half of a turned disk or built up in the three segments, each fastened with screws to the base. If the brass wire is exactly 1 in. from the shelf and the thickness of the wood between the T-slot and the upper edge of the arm ½ in., the thickness of the platform should be slightly under ½ in. to make the arms rest horizontally when they are extended.

The shelf is fastened to the base with three or four 2-in. screws, and the ends of the brass wire are run through holes in the base and clinched on the back side. The rack may be fastened in place on the kitchen wall with two large wood screws, or, if the wall is brick, with expansion bolts. The fastening in either case must be secure to hold the heavy weight of wet clothes.—Contributed by D. A. Price, Wilmington, Del.

How to Make a Pair of Foot Boats

On ponds or small lakes not deep enough for a boat one can use the foot boats, as illustrated, for walking on the water. The boats are made of white wood, known as basswood, as this wood is easily bent when steamed, and

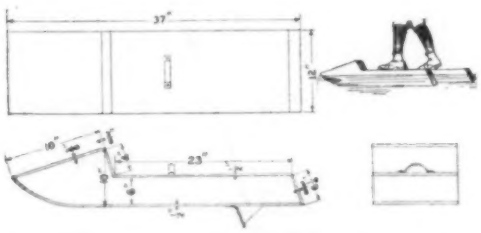
the curved part should be shaped neatly.

Two sides are cut out, as shown, and the boards are nailed or, better still, screwed to them. Each straight part may consist of one piece, in which case there will be no joints to make waterproof, but if boards of sufficient size cannot be had, pieces can be used. In this instance the edges should be planed smooth, so that a good joint may be had, which can be made watertight with white lead.

It is best to make the bottom of one piece if possible, at least for the length of the curve. The wood is thoroughly steamed, then fastened in place on the curved part.

A strap of suitable length is fastened on the top for the toe, so that the boats can be controlled with the feet.

To propel the boats along easily, a web or wing should be attached to the under side, so that it will catch the



Foot Boats for Walking on Shallow Water Where a Boat cannot be Used

water on the back thrust while it will fold up when the boat is slid forward.—Contributed by Waldo Saul, Lexington, Mass.

A Green-Corn Holder

Neat and attractive green-corn holders for table use can be made of small-sized glass drawer knobs, having a bolt 1 in. in length. The bolt head is cut off with a hacksaw, and its body is filed to make four sides running to a taper, leaving enough threads to secure it in the knob. The threads are smeared with white lead, then it is screwed into the knob and sufficient time allowed for the lead to set before using it.

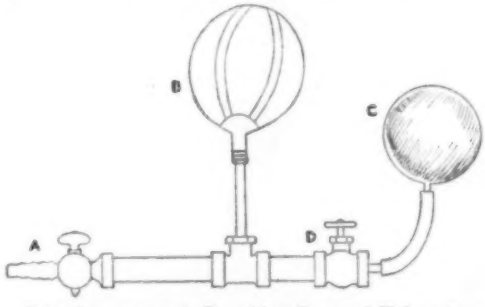
A pair of knobs are required for each ear of corn served. The square bolt end will hold the ear securely while the

The Glass Knobs Make a Clean and Sanitary Holder for the Ear of Corn

kernels are eaten from the cob.—Contributed by Victor Labadie, Dallas, Texas.

Inflating Toy Balloons

The inflation of rubber balloons may be accomplished with manufactured gas by using the simple pipe arrangement shown in the sketch. The connection A is for the gas hose, which is similar to those used for a table lamp. The gas bag B is a football or punching bag connected to the pipe as shown. This receives the gas as it is let in by the valve A. The toy balloon C is connected to the pipe in the same manner and the valve D used to regulate the flow of gas. The gas is easily pressed out of the ball into the balloon.

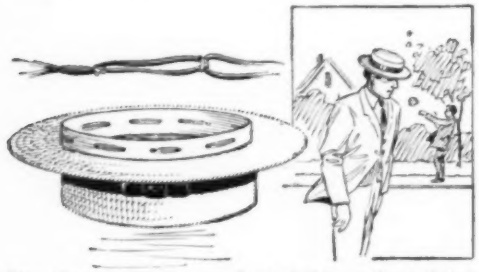


Pipe Arrangement, Punching Bag and Valves to Admit Gas to a Toy Rubber Balloon

As hydrogen gas is much better than the manufactured gas, it is best to use and can be put in the balloon in the same manner.

To Hold a Straw Hat on the Head

On windy days it is almost impossible to make a straw hat stay on the head. To avoid this trouble, place



The Rubber Bands are Linked Like a Lock Stitch and Fastened in the Band

rubber bands through the sweatband. Before inserting, make them into loops, as shown, and draw enough to be comfortable to the head. This device will save a good many steps when the wind blows.—Contributed by T. D. Hall, Fort Worth, Texas.

Carrying Fishhooks in a Cane Pole

The person using a cane pole for fishing can easily provide a place for the hooks and sinkers in the first large joint of the pole. Cut the cane off just above the first large joint, and it will leave a space, 4 or 5 in. long, which can be used for the hooks and sinkers. A cork is fitted in the end, to hold them in place.—Contributed by Victor E. Carpenter, South Bend, Ind.

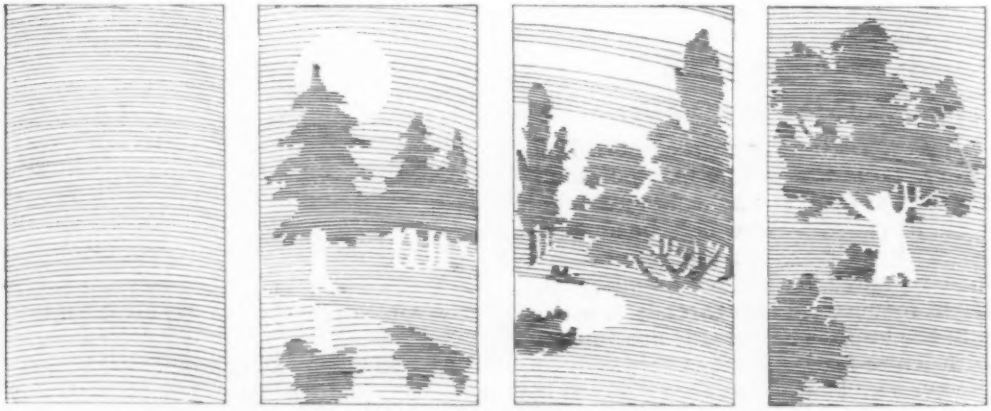
Drying Small Laundered Articles

Where mechanical drying is not in use it takes considerable time to hang out a number of handkerchiefs, laces, collars, etc., and very often the wind will blow away many of them. The task of drying these articles is made light by using a bag of mosquito netting with the articles placed in it and hung on a line. The air can pass through the netting and when the articles are dry it does not take long to take them out.—Contributed by Edward P. Braun, Philadelphia, Pa.

Decorative Wood Panels

Procure an unplaned board that is deeply scored by the teeth of the saw and mark an outline of the desired figure on its surface. Sandpaper the background lightly, cut in a moon and smooth down the tree trunks. The background can be smoothed with a sharp chisel, or large portions planed, but in all cases leave the foliage rough.

Finish the surfaces with oils or stains, applying colors to suit the parts; a piece of dried red cedar, oiled, will produce a warm red, and a green red cedar, oiled, becomes soft yellow, each producing a very pretty effect. These panels offer unlimited opportunity for originality in design and color finishing of different woods.—Contributed by Mrs. Wm. Donovan, Seattle, Wash.



The Designs are Worked into the Unfinished Surface of Boards with Sandpaper, Sharp Chisels and a Plane, and Then Colored with Dyes to Produce the Desired Effect

Electrical Heating Apparatus for the Home

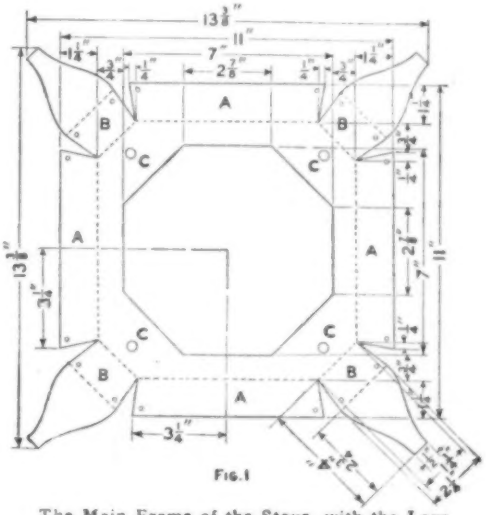
By ARTHUR MOORE

PART V—An Electric Stove

The heating element of the electric stove consists of a number of pieces of resistance wire bent into the form of a long helix, or long coil, and supported on a piece of slate or soapstone, neither of which is affected by a reasonably high degree of heat. These various coils are made of wires having different resistances per foot and are all connected so as to form two circuits with alternate wires and the wires of the same size in the same circuit. The piece of insulation upon which the coils are mounted is supported in a suitable metal frame, provided with four legs, which elevates the bottom of the stove about 4 in. above the surface on which it rests. A three-heat snap switch is mounted on one side, and connected so as to control the current supply to the heating circuits.

The main frame of the stove is made from a piece of $\frac{1}{8}$-in. sheet brass with dimensions corresponding to those given in Fig. 1. A sheet of metal, $13\frac{1}{2}$ in. square, will be required. Lay out the pattern on the sheet metal and cut away all parts outside of the full lines. An eight-sided opening is cut in the center of this piece, in which the heating elements are to be mounted. Bend the four projections, A, and the four pieces, B, down on the dotted lines until their ends come together. A small angle of brass is fastened in each corner with small rivets, to hold these pieces together. The projecting portions of the pieces B, outside of the outer dotted lines, are bent to form curved legs. Four $\frac{5}{32}$-in. holes, C, are drilled in the four corners, through which the bolts for supporting the heating elements are to pass.

A piece of slate or soapstone, 8 in. square and at least $\frac{3}{4}$ in. thick, will be required for mounting the heating element. If slate is used, be sure to select a piece without any metallic veins in it, as the wires would be short-circuited if they came in contact with the metal forming the vein. The coils may be placed directly on top of the insulating material and held in place



The Main Frame of the Stove, with the Legs Attached, is Made of Sheet Brass

by means of small screws placed in the holes indicated in Fig. 2. These holes are drilled about $\frac{3}{32}$ in. inside of the dotted lines. The coils are covered with a piece of mica, to insulate them from the utensil placed on top of the stove. In using this construction, insulation such as fire felt or asbestos may take the place of the slate or soapstone. The upper surface of the heating element should be about on a level with the surface of the stove frame.

A much better construction, and one that is quite a bit harder to make, is as follows: Cut in the upper surface of a piece of slate 18 grooves, similar to those shown in the lower portion of Fig. 2. These grooves are to form receptacles for the coils comprising the heating elements, and are about $\frac{3}{16}$ in. in depth. Four holes, D, Fig. 2, are drilled in this piece so that they

coincide with the four holes, C, Fig. 1. The diameter of the holes in the slate should be about ⅛ in. larger than those in the supporting frame, to allow

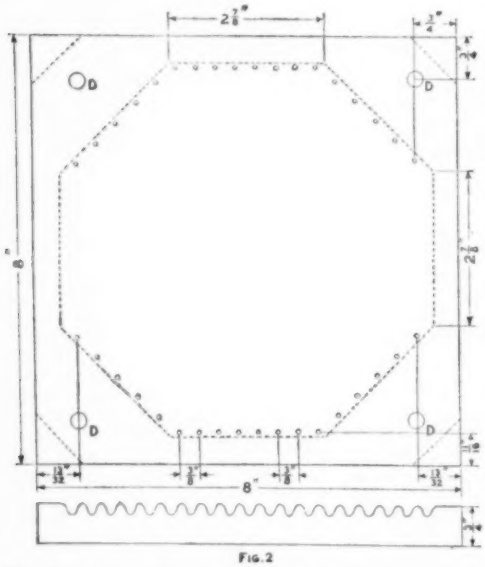


FIG. 2

The Insulating Material for the Heating Element, If Made of Slate, is Grooved for the Coils

for contraction and expanson caused by changes in temperature.

The four corners of the piece of slate are cut off along the outer dotted lines in Fig. 2, so that there will be at least $\frac{3}{16}$ in. clearance between the slate and the supporting frame when the slate is in place.

Thirty-six $\frac{3}{32}$-in. holes are then drilled through the slate inside of the eight-sided dotted figure. The holes are all drilled in the bottom of the grooves, and a small brass bolt is provided for each, long enough to project about ¼ in. below the under side of the slate. Each bolt is provided with one washer and two nuts on the under side.

The heating elements are made from two different pieces of "nichrome" resistance wire. The combined wattage input to both heating elements will be approximately 600, and the input to each will be approximately 200 and 400 watts, respectively. With this arrangement of heating elements having different capacities, it is possible to obtain three degrees of heat, if a suitable connecting switch is provided. Procure two pieces of the resistance wire, one No. 28 gauge, 14 ft. long, and the other, No. 24 gauge, 18 ft. long. Both these wires should be without insulation, as their temperature, when in use, will be much greater than any ordinary insulation will stand. These two pieces of wire must be formed into coils so that their whole length can be placed in the grooves. The coils are formed by winding the wire about a small steel rod, or stiff piece of wire. The coils can be made by hand in this manner, but a neater job can be done if a lathe is at hand. Be sure to have the coils small enough, so that their upper surface will not project above the surface of the insulation when the coils are in the grooves. Measure the length of the grooves between the holes in which each part of the heating element is placed, remembering that the same size of wires are placed in alternate grooves. These various lengths should be kept separate, and those for each of the different sizes added together. Stretch one of the coils out on a table top until its entire length corresponds with the combined

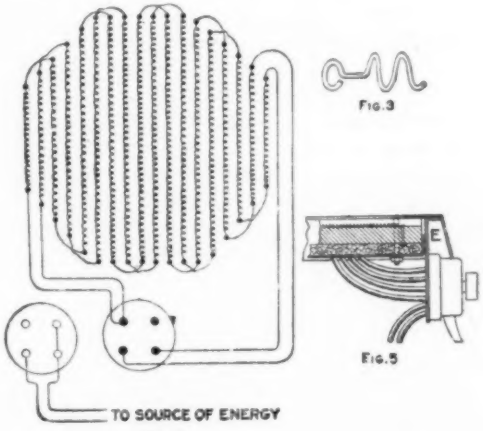


FIG. 4

FIG. 3

FIG. 5

Eyes on the End of Coils, Diagram Showing the Coil Connections and How the Switch is Attached

length of the grooves in which it is to be placed, and then, while it is in this position, mark off the lengths of the different grooves, using a small thread

fastened to the wire as a marker. The wire is then cut to length, and small eyes are formed in the ends, as shown in Fig. 3, so that each coil may be fastened in place in its proper groove by means of the brass bolts. The washer is placed adjacent to the slate, on the under side, and one of the nuts is drawn up on it tightly. The other nut is to hold the leads connecting the various coils together.

The connections of the heating elements are shown diagrammatically in Fig. 4. These connections are all made on the under side of the slate with No. 14 gauge asbestos-insulated copper wire.

In Fig. 4 the heating elements are shown connected to a plug connector, the male portion being mounted on the supporting frame of the stove, and the female portion connected to the source of electrical energy. Different degrees of heat can be obtained by rotating the free portion of the connector through angles of 90 deg. The construction of such a connector has been described in other parts of this series. The temperature to which this connector will be subjected, if mounted on the frame of the stove, will be quite a bit higher than that of the plugs formerly described, and for this reason an insulating material that will withstand a high degree of heat should be used in its construction. The plug, however, may be connected in circuit at some point away from the stove where it will not be affected by the heat, but in this case asbestos-insulated leads are run from it to the heating elements. Be sure to make the current-carrying capacity of the plug sufficient, so that it will not heat.

Perhaps the best method of controlling the connection of the heating elements to the source of energy is by means of a three-heat snap switch. This switch may be conveniently mounted on one side of the stove, and the degree of heat can then be changed by merely turning the insulated handle. An arrangement of such a switch with connections is shown in Fig. 5. The switch is mounted on a piece of ⅛-in. brass, bent in the form of a right angle, and fastened to the under side of the top of the supporting frame, shown by E. This piece of metal

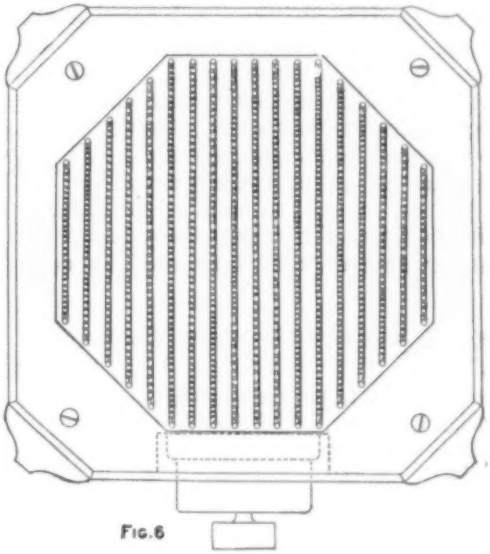


FIG. 6

The Top of the Stove Showing the Insulating Material with the Coils in the Grooves

should be cut away, directly back of the openings in the base of the switch, for the electrical conductors. An extension may be made on the piece E to one side of the switch, and an insulating bushing mounted in a hole drilled in it, through which the conductor leading to the source of energy may pass. This arrangement will provide an excellent means of anchoring the end of the conductor to the frame of the stove, and thus relieve the electrical connections of all mechanical strains.

The heating element is fastened in place as shown in Fig. 5. A metal pan is made from a piece of galvanized sheet iron, about ¾ in. in depth and having inside dimensions to fit snugly over the piece of slate. A number of holes are drilled in the bottom of this pan, for the wires leading from the heating elements to the switch to pass through. The location of the holes will depend upon the position of the bolts to which the wires are connected, which are provided with suitable in-

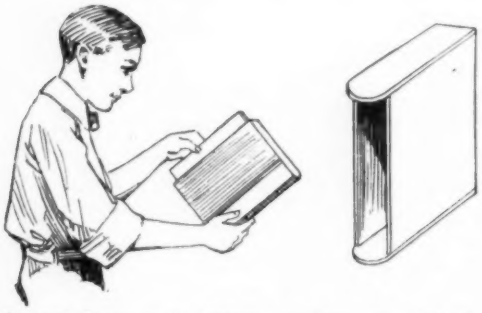
sulating bushings. Four other holes are drilled in the bottom of the pan, for the supporting bolts that are to hold the heating elements in place. These bolts should be flat-headed and taper about 1½ in. in length. The holes in the supporting frame are reamed out so that the upper surface of the head is just even with the upper surface of the supporting frame. Each of these holes is provided with a washer in the form of a piece of tubing, ⅜ in. in length, to be used in holding the bottom of the pan away from the under side of the slate and the ends of the bolts connecting the heating coils. The space between the pan and the slate is filled with asbestos wool.

The leads connecting the heating elements and switch are shown hanging down in Fig. 5, but they should be fastened up to the under side of the metal pan with small cleats, made from some thin sheet brass. These leads are all asbestos-insulated.

Four pieces of insulating material are fastened to the lower ends of the legs, so that the frame may always be insulated from any metal surface upon which the stove may be placed.

Keeping Magazines in a Book Form

Desiring to preserve magazine copies without binding them, I made up a series of boxes that gave the appear-



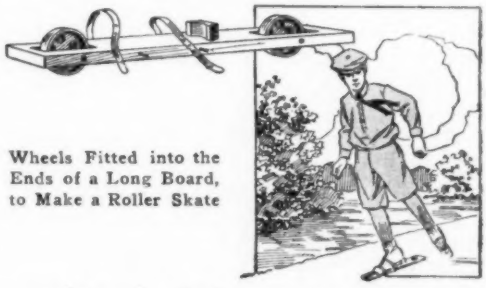
Several Boxes will Appear the Same as a Set of Books and will Preserve the Magazines

ance of books, and placed the numbers in order in them as they were received. The sides of the box consist of two thin boards, a little larger than the size of the magazine to be placed in them. The ends are made of the same material, wide enough to equal the thickness of the copies to be placed in each box, four or six numbers, or a volume. One end of these pieces is made slightly rounding, and the pieces are then put together as shown.

The rounded ends of the end pieces and the opening between the sides are covered with a piece of cardboard or bristol board, to shape the back of the box like a book. The finished box is entirely covered, like a book, with cloth or imitation leather. The backs can be lettered and decorated to appear like a book.—Contributed by R. M. Guarino, New York City.

Homemade Roller Skates

The long wheel base of the roller skate illustrated makes it quite safe and will prevent falls. The construction of these skates is simple, the frame being made of a board, 2 ft. long, 3 in. wide and 1 in. thick. Holes are mortised through the ends to admit the wheels. A small block, cut out on one side to fit the heel of the shoe, is securely fastened centrally, for width, and just in front of the rear wheel on the board. Two leather straps are fastened to one side of each board, to fasten the skate onto the shoe. The wheels can be turned from hard wood, or small metal wheels may be purchased, as desired. The axle for the wheels



Wheels Fitted into the Ends of a Long Board, to Make a Roller Skate

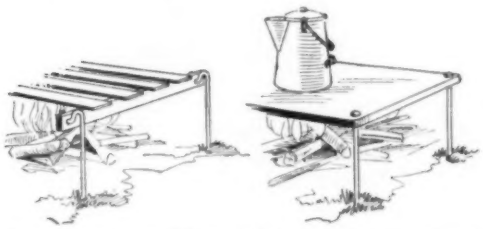
consists of a bolt run through a hole bored in the edge of the board centrally with the mortise.—Contributed by Walter Veene, San Diego, Cal.

Wall Pockets in a Tent

When camping I find a few wall pockets sewed to the tent walls at the back end provide a convenient means to hold the soap, mirror, razor and other small articles liable to be lost. The pockets can be made of the same material as the tent and sewed on as a patch pocket.—Contributed by A. M. Barnes, Atlanta, Ga.

Camp Stoves

The camp stoves illustrated are different forms of the same idea. Both can be taken apart and laid flat for packing. Iron rods, ½ in. in diameter, are used for the legs. They are sharpened at the lower end so that they may be easily driven into the ground. The rods of the one shown in the first illustration are bent in the form of a hook at the upper end, and two pieces of light tire iron, with holes in either end, are hung on these

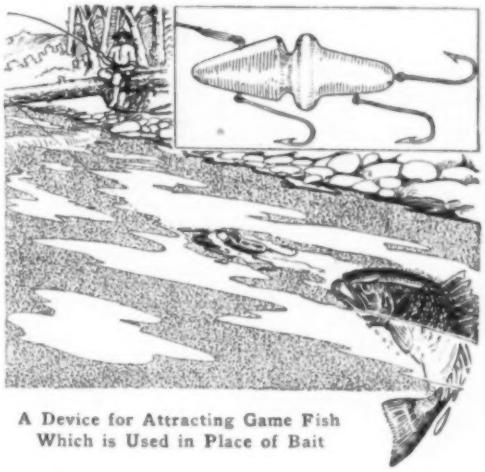


Camp-Stove Top, Either Solid or Pieced, Supported on Rods at the Corners

hooks. Across these supports are laid other pieces of the tire iron. In the other stove, the rods have a large head and are slipped through holes in the four corners of the piece of heavy sheet iron used for the top. A cotter is slipped through a hole in each rod just below the top, to hold the latter in place.—Contributed by Mrs. Lelia Munsell, Herington, Kansas.

Attractor for Game Fish

A piece of light wood, shaped as shown and with four small screweyes attached, makes a practical attractor for game fish, such as bass, etc., by its action when drawn through the water or carried by the flow of a stream. Hooks are attached to three of the screweyes and the fourth one, on the

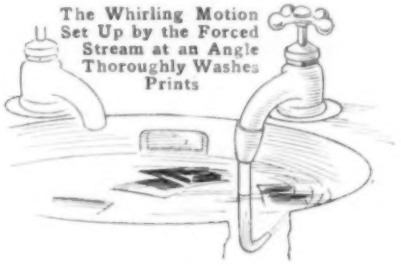


A Device for Attracting Game Fish Which is Used in Place of Bait

sloping surface, is used for the line.—Contributed by Arthur Vogel, Indianapolis, Ind.

Simple Photographic-Print Washer

The ordinary washbowl supplied with a faucet may be easily converted into a washing tray for photographic prints or film negatives. Procure a medicine dropper from a druggist, and attach it to the faucet end with a short piece of rubber tubing. Be sure to procure a dropper that has the point turned at right angles to the body.



The Whirling Motion Set Up by the Forced Stream at an Angle Thoroughly Washes Prints

When the water is turned on it is forced through the small opening in the dropper in such a manner that the water in the bowl is kept in a constant whirling motion. This will keep the prints on the move, which is necessary for a thorough washing.

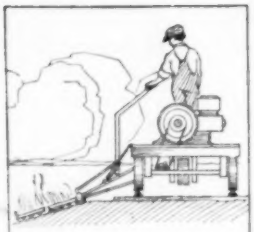


FIG 1

INTERESTING NEW PATENTS

RAILWAY MOWER (Fig. 1)—This machine is designed for mowing the sides of railway cuts and enbankments and may be adjusted to any slope by means of controlling levers, as shown. The mower is carried on a frame which is secured to the side of the car, while power is supplied through a mechanism geared to the car axle.

NOVEL ARRANGEMENT OF STREET-CAR SEATS (Fig. 2)—The seats are so arranged as to keep the incoming and outgoing passengers separated in cars where entry and exit are at the same end. The front of the car has a single row of seats with an aisle at each side, while the rear portion is provided with the ordinary double row of seats with the aisle between.

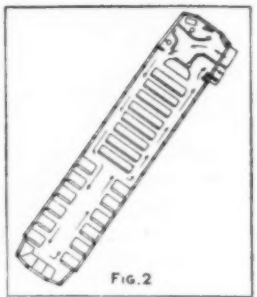


FIG.2

MIRROR INDICATOR FOR MEASURING STATURE (Fig. 3; British patent)—The scale is marked on the mirror and has its zero 4½ in., or the normal distance between the eyes and the top of the head, below the platform on which the user stands. To use the device it is only necessary to look directly into the mirror and note the scale mark that coincides with the centers of the eyes.

FIG.3

ADVERTISING DEVICE (Fig. 4)—This device consists of a stereopticon slide plate on which a clock face is marked and over which is a mechanism carrying clock hands. It is used for throwing an image showing the time on a wall where poster advertising is displayed. The movement of the hands is controlled by a thumbscrew, while an opaque plate, placed over the middle of the stereopticon plate, prevents an image of the mechanism from being thrown on the wall.

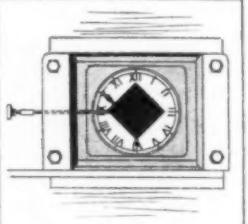


FIG.4

SCRAPER THAT REVERSES WHEN IT IS PULLED BACKWARD (Fig. 5)—The essential feature about this scraper is that it automatically assumes an upright position or the reverse, according to the direction of the pull, upsetting forward or backward on the curved portion at the back. It is apparently intended for excavating building sites or other small areas, and is operated by an engine or motor having drums for handling two cables.

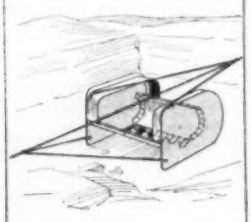


FIG.5

FIG.6

CAN OPENER WITH SHIELD FOR FINGERS (Fig. 6)—This can opener is of an ordinary type, but is provided with a curved shield which projects downward from the handle and is designed to protect the fingers from injury in case the cutter slips. The upper part of the handle is made flat and furnishes a convenient thumb rest.

SUGAR BOWL WITH MEASURING SPOUT (Fig. 7)—Pressure on the lever pivoted to the lid raises the slide valve at the outer end of the spout, and, by means of the lever connections shown, lowers the slide valve located inside the bowl, thus permitting only a measured quantity of the pulverized sugar to escape. When the pressure on the lever is released, both valves are returned to their original position under the action of the spring. When the lid is to be raised, the lever is detached at the pivot and is swung out of the way.

FIG.7

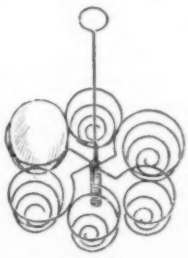


FIG.8

HOLDER FOR BOILING EGGS (Fig. 8)—In using this device, the eggs are simply placed in the wire pockets, and the holder and eggs are then set into the boiling water. The pockets are connected with the stem in such a way that they can be folded compactly when not in use.

SWIMMING GLOVE (Fig. 9)—The glove is made with pockets for the thumb and each of the fingers, and these pockets are connected by a heavy web designed to bear against the water.

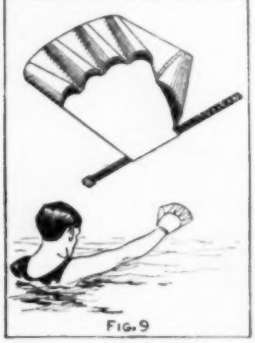


FIG.9

HOLDER FOR FEED BAG (Fig. 10)—The feature about this holder is that it is supported entirely from the top of the hames so that the horse is free to move its head up and down, while the feed bag remains in one position. The end of the braced supporting rod is provided with rings by which it is readily slipped over the hames when needed.

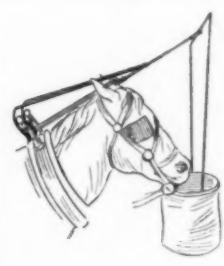


FIG.10

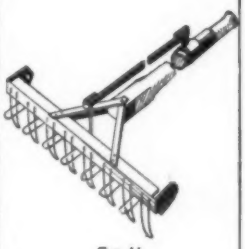


FIG. 11

RAKE WITH SELF-CLEANING ATTACHMENT (Fig. 11)—The bar to which the rake teeth are attached consists of an angle bar provided with end lugs that project backward toward the handle. Behind and under this, works a smaller angle bar which, by means of similar lugs, is pivoted to the main bar. The smaller bar carries wire loops that project between the teeth of the rake. When the rake is to be cleaned, this bar, and with it the wire loops, is turned downward by a lever connected with a sliding sleeve on the handle.

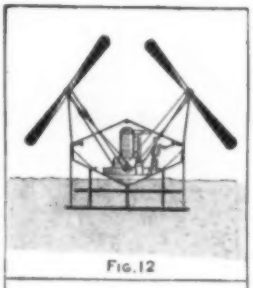


FIG. 12

BOAT WITH MOVABLE WATER PLANES (Fig. 12)—This curious craft is equipped with aerial propellers and consists of a hull having submerged horizontal plates which are designed to act against the water and cause the craft to skim the surface when driven at high speed. The plates are mounted on pivots and are controlled by levers, so that they may be turned at any angle to increase or decrease the supporting effect of the water.

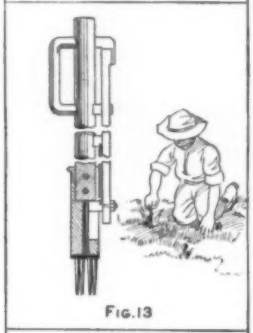


FIG. 13

WEED EXTRACTOR (Fig. 13)—This garden tool is provided with projecting prongs designed to fit around the weed or other plant to be extracted and is equipped also with a plate fixed to the end of a plunger, which, when forced down, cleans the prongs. This plate fits inside the ring of prongs, while the plunger slides in a notch in the body of the tool and is actuated by a lever.

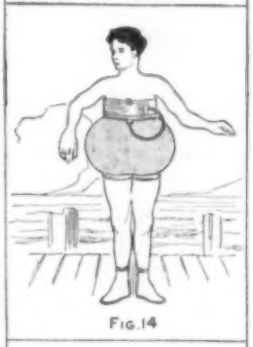


FIG. 14

LIFE PRESERVER (Fig. 14)—This curious device is designed to support the middle of the body and leave the arms free for swimming. It consists of a waterproof inflatable bag secured at the bottom to waterproof trousers, and with a top arranged to be drawn tightly around the body just below the armpits.

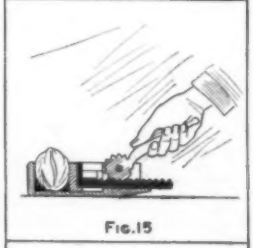


FIG. 15

NUTCRACKER (Fig. 15)—This nutcracker consists of a frame carrying a plunger, and in using, the nut is simply placed between the lugs and force is applied through the ratchet as shown.

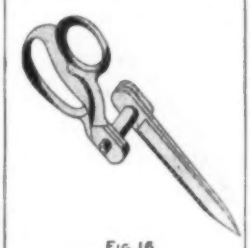


FIG. 16

SHEARS WITH OFFSET HANDLES (Fig. 16)—The pivot tube is rigidly secured to the lower blade and to one of the handles, while the upper blade and its handle are rigidly connected by a rod that works in the pivot tube. This invention is evidently intended for special work where offset handles are a necessity.

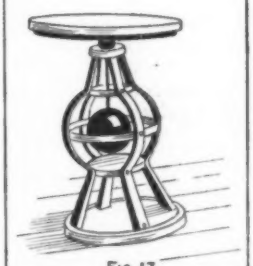


FIG. 17

LEVELING APPARATUS FOR TABLE TOP (Fig. 17)—The top of the table is supported on a ball which fits closely into a bearing at the top of the table support. Projecting downward from the ball is a rod that carries a weight at its lower end, and the table top assumes a level position under any conditions on account of the pendulum action of this weight. The table legs are curved outward at the middle to allow room for the weight to swing.

FIG. 18

SWIMMING SUPPORT (Fig. 18)—An inflatable bag made of stiff sheets of waterproof material hinged together is provided with straps for extending around the neck and around the waist of the swimmer. The front end of the bag is shaped to a point to reduce the resistance of the water.

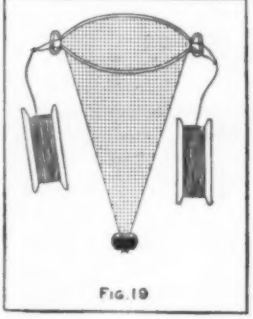


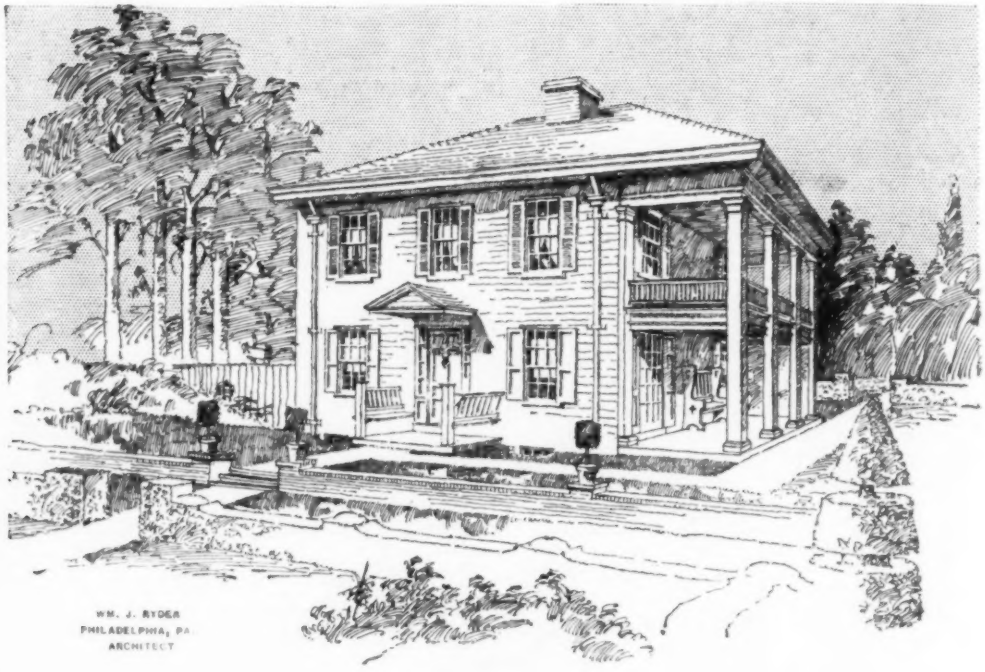
FIG. 19

NET FOR RECOVERING GOLF BALLS (Fig. 19; British patent)—The top of the net is attached to a wire rim, while the bottom is lightly weighted so that it will retain a conical shape and will drag through the water in such a way as to catch a golf ball that is floating on the surface.

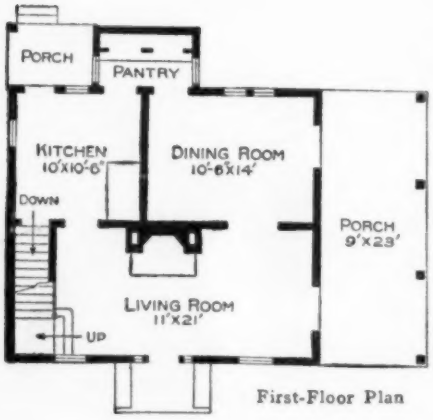
FIG. 20

ADJUSTABLE MIRROR (Fig. 20)—This mirror is provided with an outer frame, or bail, by which it is set up on the floor for securing a view of shoes or the bottom of a skirt. The bail is attached to the mirror frame by a clamp bolt, and with this the mirror may be so adjusted that it will stand at any desired angle.

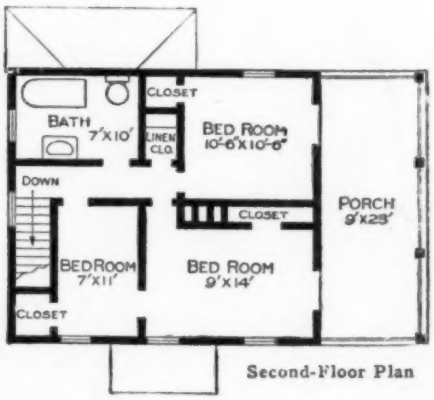
FRAME COLONIAL DWELLING OF MODERATE COST



THIS attractive colonial dwelling, evidently designed for a country or suburban setting, has six rooms and basement and is estimated to cost $3,500. It is of frame construction and has exterior walls of clapboards. Not the least attractive feature of this dwelling is the colonial porch, extending entirely across one side, and reached directly from four rooms. In its interior arrangement the house shows the greatest economy in the use of space. There is no hallway on the lower floor, entrance to the dwelling being directly through the living room. In this room, which contains a massive fireplace, is the stairway, placed at one end of the room and in a location to take up the least space. An unusual arrangement is that by which the passage from the kitchen to the dining room is through the pantry, which is built as an offset from the back of the house. The upper floor contains three bedrooms, each of which is provided with ample closet room, a 7 by 10-ft. bathroom, and a linen closet.



First-Floor Plan



Second-Floor Plan